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ABSTRACT

This notebook was developed cooperatively by the United States Soil Conservation Service and Iowa State University to be used by teachers in providing instruction regarding certain aspects of natural resources. It includes four sections which provide: (1) an instructional plan about the conservation provisions of the 1985 Food Security Act; (2) an instructional plan that deals with planning skills associated with the 1985 Food Security Act; (3) a natural resources activities handbook; and (4) an instructional module which deals with soil erosion and soil productivity. Also provided is an evaluation form to be used by teachers in assessing the effectiveness of the notebook. (TW)

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NATURAL RESOURCES EDUCATION

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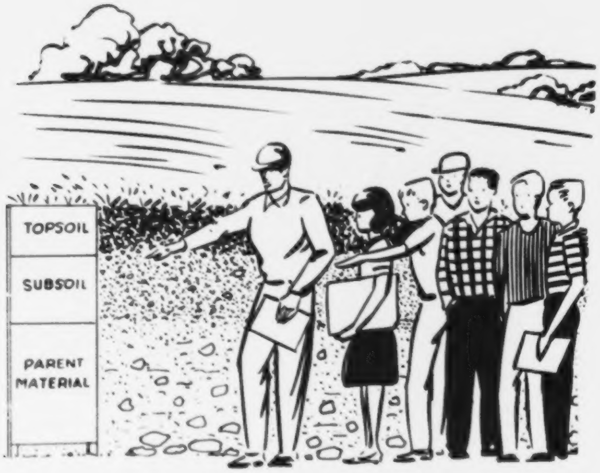

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NATURAL RESOURCES EDUCATION NOTEBOOK

This Natural Resources Education Notebook was made possible through the U.S. Soil Conservation Service - Iowa State University Partnership established in July 1987.

Prepared by Eldon C. Weber
U.S. Soil Conservation Service
ISU Liaison

Agricultural Education Department
Iowa State University

This packet and videos are available from the Iowa Association for Vocational Instructional Materials Center, 208 Davidson Hall, Iowa State University, Ames, IA 50011. Telephone (515) 294-6673. Costs are as follows:

	Cost
Natural Resources Education Instructional Packet.	$15
VHS Video Tapes. . . . . (One tape containing the following programs)	$30

 1. Introduction
*2. "How to Stay Eligible" - Food Security Act
*3. "Your Conservation Plan" - Food Security Act
*4. "Soil Erosion - Productivity Connection"
*5. "Choked Waterways" - Off-Site Erosion

Any one of the four above programs (*) on an individual tape .$15

Discounted prices are available for quantity orders.

Sections V; VI; VII not included. Available at a later date. These sections are not completed at this time.

NATURAL RESOURCE EDUCATION

Table of Contents

Section

I. Conservation Provisions 1985 Food Security Act Instructional Plan

II. Planning Skills 1985 Food Security Act Instructional Plan

III. Natural Resources Activities Handbook

IV. Soil Erosion/Soil Productivity Connection Instructional Module

V. High Technology Impact on Natural Resources Instructional Module

VI. Values in Natural Resource Conservation Instructional Module

VII. New Topic Areas in Water Quality

References Included with the Notebook

Losing Ground

Soil Erosion by Water

Food Security Act Fact Sheets

60 minutes VHS Video Tape "Soil Conservation and Ag Respiratory Hazard Series" included in the 1988-89 IVATA instructional materials packet containing the following Natural Resource Education topics:

> "How to Stay Eligible" and "Your Conservation Plan" for Food Security Act Instructional Plan
>
> "Soil Erosion Productivity Connection" - Soil Erosion/ Soil Productivity Instructional Module
>
> "Choked Waterways" - For Soil Erosion/Soil Productivity Instructional Module

These educational materials were produced by the U.S. Soil Conservation Service.

Teacher's Evaluation of "Natural Resources Education" Notebook Materials

Please complete and return this evaluation form to Agricultural Education Department, 201 Curtiss Hall, Iowa State University, Ames, IA 50011.

To assist us in providing you with the most useable instructional materials in the future, we would appreciate your response to the following questions:

1. Were the materials organized in a manner that is easy for you to use? _____ Yes _____ No What would you recommend for improvement?

2. Does the content of the materials satisfy your curriculum needs? _____ Yes _____ No What additional curriculum materials are needed under the broad topic of natural resources?

3. Do you need more inservice training to use these materials most effectively? _____ Yes _____ No If so, what would you recommend?

4. Have you used any of these educational materials to date? _____ Yes _____ No If yes, which ones?

5. Will you use the materials as new units? _____ Yes _____ No If so, which ones?

6. Will you incorporate them into existing units? _____ Yes _____ No If so, which ones?

7. Of the materials included in the Natural Resources Education Notebook, of which do you plan to make the most use?

8. What other general recommendations would you have for future educational materials?

Signature ________________________________

Mailing Address ___________________________

____

Conservation Provisions 1985 Food Security Act

A Teaching Guide on

Soil and Water Conservation

"Need and Benefits"

Objectives

(The instruction described here should precede teaching about the conservation provisions of the Food Security Act of 1985.)

1. Describe how soil is formed and the substances contained in soil.
2. Describe the principles involved in water erosion and wind erosion; and the types of erosion.
3. Identify the types and the extent of erosion occuring in the coummunity, in Iowa and in the nation.
4. List the costs, damages and disadvantages of erosion (long- and short-term effects of soil erosion).

Materials/References Needed

(For (1) materials needed, (2) visual masters, (3) activities, (4) interest approach, (5) teaching procedures) and (6) extra suggested activities - Refer to the materials referenced under teaching procedures.)

Teaching Procedures

1. Use selected excerpts from the following materials in developing an appreciation for the need and benefits of soil and water conservation:

    a. An Instructional Packet on Soil And Water Conservation For Agriculture Students - compiled by Brad Harrison

    Topic #1: Soil Loss Importance

    Question #1: What is soil?

    Question #2: Why is soil important to you?

    Question #3: What is soil erosion and is it serious?

    Topic #2: Soil Erosion

    Question #1: How does soil erosion start?

    Question #2: What are the different kinds of erosion and the factors involved?

Developed by Eldon Weber, 8/87

Question #3: Is soil erosion a problem in our community?

Question #4: So why should farmers care about what erosion is doing to their land?

b. Soil Conservation and Management

(Project 2000) Dr. Alan Kaher, Project Director

Problem Area I: Why is conservation of our soils important?

Problm Area II: What are the types of soil erosion?

Problem Area III: How are soils' erosion potential classified?

Problem Area IV: What factors influence soil erosion?

2. Use the following brochure to illustrate important points covered in the first two references:

"Losing Ground - - Iowa's Soil Erosion Menace and Efforts to Combat It", Iowa SCS Brochure

Topic #1 A Matter of Inches

Topic #2 Soil Erosion in Perspective

Topic #3 Erosion - What You Do and Don't See

Topic #4 Erosion Cuts Crop Yields

Topic #5 Costs Add Up Over Time

Topic #6 High "Off-Site" Costs of Erosion

- Farmland Damages
- Transportation
- Recreation and Fish and Wildlife
- Drinking Water

Topic #7 Soil Conservation Tied to Farm Programs

Introduction to (Food Security Act of 1985)

3. Conclude by asking students to share soil conservation practices being used in the community to conserve soil and water.

4. Inform the students that the next lesson will focus on conservation provisions of the 1985 Farm Security Act (new farm bill).

INSTRUCTIONAL PLAN ON CONSERVATION PROVISIONS OF THE 1985 FOOD SECURITY ACT (FSA)*

Objectives

After the completion of this unit, the students will be able to:

1. Name and explain the four conservation provisions of FSA.
2. Identify USDA programs affected by FSA.
3. Relate options FSA gives to farmers.
4. Recognize the benefits of each FSA provision.
5. Communicate how farmers can stay eligible for USDA programs and at the same time conserve soil and improve water quality.

Materials/References Needed

SCS Slide/Tape Set and Brochure, "How to Stay Eligible for USDA Programs"

SCS Fact Sheet, "Conservation Provisions", March 1987

SCS Fact Sheet, "Benefits of the Conservation Provisions", May 1987

Visual Masters

VM-SC-1	FSC Conservation Provisions
VM-SC-2	Benefits from Conservation Reserve Provision
VM-SC-3	Benefits from Conservation Compliance Provision
VM-SC-4	Benefits from Sodbuster Provision
VM-SC-5	Benefits from Swampbuster Provision
VM-SC-6	A Farmer's Options Under FSA
VM-SC-7	Requirements for Farmers to Stay Eligible for USDA Programs

Activities

ACT-SC-1	What is a Highly Erodible Field?

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*Developed by Eldon Weber, August 1987

Interest Approach

1. Ask the following questions:

    a. What soil and water conservation practices are used in our community?

    b. What additional conservation practices are needed?

    c. Would you be interested in learning more about a program which will bring thousands of dollars into our community?

    d. Would you like to be an active participant in assuring that you, your parents, or other relatives, and the whole community benefit from this program?

2. Explain that the 1985 Food Security Act (New Farm Bill) will influence a dramatic change in agriculture as we know it today. Everyone needs to understand the provisions and potential benefits of the Act. Landowners and operators must take action to be eligible to participate in USDA programs that could mean thousands of dollars to them. The Act requires farmers to protect their land against soil erosion in exchange for farm program benefits.

Teaching Procedures

1. Use the slide/tape set "How to Stay Eligible for USDA Programs" to introduce the four conservation provisions of the Food Security Act: (a) Conservation Reserve, (b) Conservation Compliance, (c) Sodbuster and (d) Swampbuster Programs.

2. Use VM-SC-1 and SCS Fact Sheet "Conservation Provisions" to emphasize and explain the four conservation provisions of FSA.

3. Direct students in completing ACT-SC-1 to explain and apply the term "highly erodible cropland". (Answers to Problem: No. 1. = Yes - - - 44% highly erodible; No. 2. = Yes - - - field has more than 60 acres of highly erodible land; No. 3 = No - - - only 26% of the field is highly erodible.)

4. Use the following questions in a class discussion to show how the FSA conservation provisions apply to your community:

    a. Has conversion of marginal land to cropland been a problem in our community? Why? or Why not?

b. How many farmers in our community will be affected with FSA provisions?

c. Why are farmers electing to place some of their land in the Conservation Reserve?

d. Why should farmers in the community be aware of FSA provisions?

5. Use ACT-SC -2, 3, 4, and 5 to identify the benefits of the FSA provisions to farmers and communities.

6. Explain that FSA differs from past farm legislation in that farmers must take action to retain eligibility for USDA farm program benefits. Discuss how the following USDA programs benefit farmers and would be affected by FSA:

   - Price and income support
   - Crop Insurance
   - FHA loans
   - Commodity Credit Corporation storage payments
   - Farm storage facility loans
   - Conservation Reserve Program annual payments

7. Use VM-SC-6 in a discussion of the options farmers have under the 1985 Farm Bill. Explain that a conservation plan is a record of the producers decisions to control erosion. It is developed with the help of the SCS.

8. Use ACT-SC-7 to emphasize what farmers must do to stay eligible for USDA programs. Explain how each of the five points apply to farms of students in the class or other farms in the community.

9. Conclude by emphasizing:

   a. The importance of understanding the provisions and benefits of the Food Security Act of 1985.

   b. Help is needed to inform your parents and others (we could hold an informational meeting for your parents and then you could work with them individually to apply the information to your own farm.)

   c. Many of you will be actively involved or responsible for applying the FSA conservation systems by January 1995.

   d. Our next task will be to learn what makes up a conservation plan under FSA.

FSA CONSERVATION PROVISIONS

1. Conservation Reserve - 10-year program to retire highly erodible land
2. Conservation Compliance - develop by 1990 and apply by 1995 a conservation plan for highly erodible fields
3. Sodbuster - conservation plan required to convert highly erodible grass/tree land to tilled crops
4. Swampbuster - - discontinue production of tilled crops on newly converted wetlands

BENEFITS FROM CONSERVATION RESERVE PROVISION

- Reduce soil erosion
- Reduce sedimentation
- Ensure productivity of the soil
- Reduce herbicide and fertilizer field loss
- Improve water quality
- Reduce crop surplus
- Provide guaranteed income for farmers
- Improve air quality
- Increase wildlife habitat
- Improve moisture management

BENEFITS FROM CONSERVATION COMPLIANCE PROVISION

- Sustain productivity of highly erodible croplands now being cropped

- Protect the land for future generations

BENEFITS FROM SODBUSTER PROVISION

- Keep fragile land in grasses or trees
- Start applying conservation measures to newly tilled land
- Maintain long-term productivity of soils
- Reduce costs of dealing with effects of erosion onsite and offsite

BENEFITS FROM SWAMPBUSTER PROVISION

- Provide wildlife habitat
- Provide additional sites for recreation
- Help control floods
- Recharge ground water supplies
- Improve water quality

A FARMER'S OPTIONS UNDER FSA

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1. Develop and apply conservation plan (Remains eligible for USDA farm program benefits)

2. Plant permanent cover on highly erodible land (Enter land in Conservation reserve)

3. Produce crops on highly erodible land without using approved conservation system (Lose eligibility for USDA farm program benefits)

4. Produce crops on newly converted wetlands (Lose eligibility for farm program benefits)

REQUIREMENTS FOR FARMERS TO STAY ELIGIBLE FOR USDA PROGRAMS

1. See if you have highly erodible land
2. Develop an SCS approved conservation plan by 1990
3. Carry out plan by 1995
4. Don't drain wetlands to grow crops
5. Don't break out highly erodible land without an approved conservation plan

WHAT IS A HIGHLY ERODIBLE FIELD?

A field must be predominantly highly erodible and used to produce an agriculture commodity before it is subject to either sodbuster or conservation compliance provisions. A field is predominantly highly erodible when one-third or more of the field is made up of highly erodible soil map units, or if the highly erodible area is 50 acres or more.

Problem No. 1. Assume you have a 45 acre field in which 20 acres are made up of highly erodible units as identified by the soil survey map. Is this a highly erodible field? Why? or why not?

Problem No. 2. Assume you have a 200 acre field in which 52 acres are made up of highly erodible units as identified by the soil survey map. Is this a highly erodible field? Why? or Why Not?

Problem No. 3. Assume you have a 190 acre field in which 49 acres are made up of highly erodible units as identified by the soil survey map. Is this a highly erodible field? Why? or Why not?

Planning Skills

1985

Food Security Act

INSTRUCTIONAL PLAN
DEVELOPING CONSERVATION PLANNING SKILLS FOR FOOD SECURITY ACT OF 1985

("Conservation Provisions of the 1985 Food Security Act" should be taught prior to this unit. It was handed out at the September 2 and 3, 1987 inservice meetings. It is available from the Agricultural Education Department at Iowa State University if you haven't received a copy.)

Objectives

After the completion of this unit, the students will be able to:

1. Understand the process of conservation planning.
2. Estimate which fields fall into the highly erodible category as called for in the conservation provisions of the Food Security Act of 1985. (The formal determination of "Highly Erodible Land" is made by the Soil Conservation Service)
3. Understand the value of controlling erosion within a tolerable limit.
4. Appreciate the value of conservation systems that reduce soil losses to a permissible limit.

Materials/References Needed

1. SCS Slide/Tape Set, "Invisible Erosion" (6 1/2 minutes)
2. SCS Slide/Tape Set, "Universal Soil Loss Equation" (10 minutes)
3. SCS Brochure, "How to Figure Soil Losses" (copy enclosed)
4. SCS Brochure, How to Stay Eligible for USDA Programs" (copy enclosed)
5. SCS Brochure, "Losing Ground" (Iowa's soil erosion menace and efforts to combat it.) (Distributed at the 1987 Iowa AST Conference.)
6. SCS Slide/Tape Set, "Soil Conservation Systems for Iowa Cropland" (13 minutes)
7. Specific Universal Soil Loss Equation information available from SCS District Conservationist.

Developed by Eldon Weber, September 1987

8. County Soil Survey available from the Soil Conservation Service or Extension Service

9. Instructional material developed by Brad Harrison and distributed to Iowa ag teachers in 1983 entitled "An Instructional Packet on Soil and Water Conservation"

10. Highly Erodible Land (HEL) list for each county, available from the Soil Conservation Service

11. Computer program entitled "Common Cents Conservation", available from Agri Education, Inc., Box 456, Stratford, Iowa 50249. (Cost: $45)

Visual Masters

VM-SC-1	FSA Conservation Provisions
VM-SC-2	Occupations Where Conservation Planning Skills Are Beneficial
VM-SC-3a	Universal Soil Loss Equation and VM-SC-3b Wind Erosion Equation
VM-SC-4	A Soils Potential to Erode
VM-SC-5	Erodibility Index
VM-SC-6	Equipment Tillage Triangle
VM-SC-7	Take Pride in America: Save Our Soil

Activities

ACT-SC-1	Why Do We Plan? (and Key)
ACT-SC-2	Invisible Erosion: Main Points to Remember (and Key)
ACT-SC-3	Steps in Developing a Conservation Plan (and Key)
ACT-SC-4	Get Your Conservation Plan

Interest Approach

1. What we are beginning today is a first. The U.S. Soil Conservation Service has great expectations of us. The chief of SCS in Washington, D.C. asked that vocational agriculture and FFA students be involved in carrying the message about the new farm bill, the Food Security Act of 1985. It is hoped that what you learn in this unit, you will take

home to your parents and neighbors to assist them in remaining eligible for farm programs.

2. We have talked about the four conservation provisions (VM-SC-1) of the new farm bill and how they will influence a dramatic change in agriculture, as we know it today. In this unit, we are going to take a look at one of the four conservation provisions, conservation compliance. Let's review what we have learned about satisfying the requirements of conservation compliance: To remain eligible for USDA programs, farmers must protect their land against soil erosion. To qualify, farmers need a conservation plan by January 1, 1990; and they need to carry out the plan by January 1, 1995.

3. Inform the class members that they will be developing conservation planning skills that will help them understand and appreciate the conservation planning process. In this unit, you will learn how to estimate which fields would fall into the "highly erodible" category and get an appreciation for the effectiveness of common conservation systems in reducing erosion on highly erodible fields.

Teaching Procedures

1. Ask the following questions: Why do we plan? Direct students in completing ACT-SC-1 to illustrate the importance of planning most everything we do. (You can have some fun with this one as you find plumbing fixtures and appliances in inappropriate rooms.) Review using ACT-SC-1 Key. Ask: Why would planning be important in applying soil and water practices to a farm? Emphasize that planning helps insure success in reaching our goals and objectives. It helps get important things done on time and in a satisfactory way. (You wouldn't think of going on a trip without a road map.) Relate that there are alternatives to solving erosion problems. Planning can help determine which conservation practices would be most cost effective and consistent with the farmer's goals and objectives.

2. Illustrate the importance of a conservation plan by drawing two 160 acre farms on the chalkboard; one with all class 1, excellent cropland; the other with a farm pond, a swamp, two corners with highly erodible fields (20 acres each), the remaining is excellent cropland. Then, ask "Would you plan the

field boundaries differently for the two farms?" Explain why field boundaries would be different.

3. Explain that in this unit we are going to concentrate on conservation planning as it relates to erosion control. In future units we'll deal with other important planning considerations such as water quality, crop production and wildlife.

4. Show "Invisible Erosion" (SCS slide/tape set) to emphasize the need for soil survey information in developing a conservation plan as related to the Food Security Act of 1985. Review ACT-SC-2 before showing the slides to alert students to main points they should observe. Review the main points afterwards (ACT-SC-2 Key).

5. Use VM-SC-2 to identify occupations where an understanding of conservation planning would be beneficial. Discuss why people in each occupation need to understand conservation planning.

6. Use ACT-SC-3 in a discussion of the steps in developing a conservation plan for a farm. Explain each step in the planning process (ACT-SC-3 Key).

7. Inform the class members that soil loss from a particular cropland field can be predicted using the Universal Soil Loss Equation. Use SCS brochure "How to Figure Soil Losses" to present the equation. Ask students what they think each letter represents. After some guessing by the students, tell them to check their responses while viewing the slide/tape set "Universal Soil Loss Equation". Review each part of the equation after viewing the slides.

8. Demonstrate the use of the Universal Soil Loss Equation (USLE) and the Wind Erosion Equation using the examples in the SCS brochures, "How to Stay Eligible for USDA Programs","How to Figure Soil Losses", VM-SC-3a and VM-SC-3b.

9. Use a soil survey report of your county (or if one is not available, soil information from your SCS office) to apply the Universal Soil Loss Equation, on one of the student's farms. (Refer to Topics #5 and 6 in references "An Instructional Packet on Soil and Water Conservation")

10. Use VM-SC-4 to explain that Highly Erodible Land (HEL) is determined from the soil's potential to erode (not how it is presently being farmed (as shown on VM-SC-3a and b). Use VM-SC-5 to explain

the erodibility index for determining HEL land (potential to erode at 8 times the tolerable level).

SCS uses an erodibility index to determine highly erodible lands. The Erodibility Index (EI) of a soil is determined by dividing the potential annual rate of erosion by the T (tolerance) value for that soil. SCS uses a portion of the equations to estimate the EI for erosion.

For water erosion, the equation is EI = RKLS/T, where (R) is the rainfall and runoff value, (K) is the resistnce of a particular soil to erosion, and (LS) is the length and steepness value of a slope.

For wind erosion, the equation is EI = CI/T, where (C) is a climatic value of wind speed and surface moisture and (I) is the degree to which soil resists wind erosion. A soil map unit is highly erodible if the erodibility index is 8 or greater.

11. To make it easy to identify HEL fields without having to use the universal soil loss equation each time, SCS has developed a list of HEL mapping units. This list is available to you from your local SCS office. Check that list against the soil mapping units on your farm. You can find the soils on your farm in a soil survey, which is also available from your SCS office. Use the HEL list to identify potential HEL fields on one of your student's farms. (There are separate HEL lists for wind and water erosion. For water erosion there are two lists.) (1) Highly erodible mapping units and (2) Potentially highly erodible mapping units. For classroom purposes, treat the potentially highly erodible units as HEL, as SCS will have to make field determinations on most of these units. (This will require use of the soil survey information to match HEL mapping units to the soil map). If one-third or more of the field or 50 acres or more in the field is made up of HEL mapping units, the field is highly erodible. Divide the students into small groups to identify highly erodible fields on other student's farms. (This exercise could be used to identify potential HEL fields on aerial photo maps of student's farms, available from the SCS District Conservationist.)

12. Explain that the Food Security Act calls for having conservation systems in place on HEL fields by January 1, 1995. Also explain that the Iowa 2000 law was passed by the Iowa legislature to encourage farmers to have their needed conservation practices on the land by the year 2000. (So there is

emphasis on soil conservation at both the state and national levels.)

13. Use the SCS slide/tape set, "Soil Conservation Systems for Iowa Cropland" to introduce conservation systems commonly used in Iowa. Direct students to make a list of these practices as they view the slides. After viewing the slides, ask students to identify practices being used on their farms and in the community. Discuss advantages of each practice. Emphasize that practices can be combined to provide a total soil conservation system for farmers. (For instance, one system may be a combination of contouring, grass waterways and headlands). What other systems can you identify that are made up of single conservation practices? The SCS brochure, "Losing Ground", can be used to illustrate conservation systems and to summarize key points. Use VM-SC-6 to acquaint students with tillage terminology.

14. Use the chart in SCS brochure, "How to Stay Eligible for USDA Programs", to illustrate relative soil loss reduction value of typical conservation systems. (Refer to Topic #3 in reference "An Instructional Packet on Soil and Water Conservation)

15. Give students hands-on-experiences in selecting conservation systems to reduce soil losses by using USLE information available from the SCS District Conservationist, or by using the computer program "Common Cents Conservation", to allow students an opportunity to select conservation systems on their farms or neighboring farms that will reduce erosion to a permissible limit.

16. Summarize this unit by using ACT-SC-4 to emphasize conservation compliance time deadlines and to review the planning process. Use VM-SC-7 to emphasize the importance of a conservation ethic and the opportunity for students to take an important part in educating their parents and other people in the community. Emphasize the importance of farmers needing to schedule their conservation planning assistance with the local District Conservationist in 1988 to give them priority and assure them that technical assistance will be available. Ask the students if they would like to sponsor a Food Security Act educational meeting for their parents, and if so, make plans.

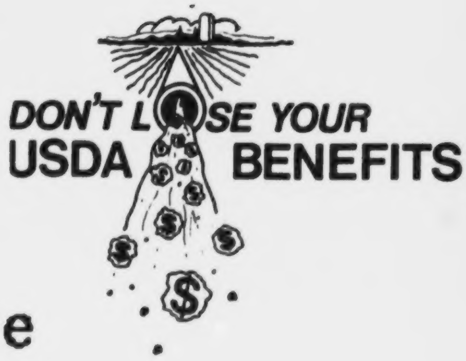
Suggested Extra Activities

1. Take the students to a farm (could be one of the student's farms) and go through the planning process on one or more fields. The farmer could be on hand to tell what his or her objectives are in the farming operation and which conservation systems are most appealing. Students could compare the soil survey information to what they see in the field and determine soil losses based on how the farmer farmed these fields.

2. Direct students to develop a conservation plan for their home farm or some other farm in the county.

VM-SC-1

FSA CONSERVATION PROVISIONS



1. Conservation Reserve - 10-year program to retire highly erodible land

2. Conservation Compliance - develop by 1990 and apply by 1995 a conservation plan for highly erodible fields

3. Sodbuster - conservation plan required to convert highly erodible land to tilled crops

4. Swampbuster - - discontinue production of tilled crops on newly converted wetlands

Occupations Where Conservation Planning Skills Are Beneficial

youth
for
conservation

- Soil Conservationists
- Soil Scientists
- Farmers and Ranchers
- Farm Managers
- Land Use Planners
- City Planners
- Agronomists
- Wildlife Biologists
- Farm Loan Officers
- Agriculture Engineers
- Civil Engineers
-
-
-
-

COMMUNITY PLANNING
SOIL MAP

Universal Soil Loss Equation

$$A = R \times K \times LS \times C \times P$$

where **A** = the estimated soil loss in tons per acre per year
R = a rainfall factor
K = a soil erodibility factor
LS = the slope length and steepness factor
C = the cropping management factor
P = the erosion control practice factor

VM-SC-3a

Credit: Hudson, Norman. Soil Conservation. Ithaca, NY: Cornell University Press, 1981.

The Wind Erosion Equation

$$E = f\,(IKCLV)$$

E = Soil loss potential

∫ = Function of

I = Soil Erodibility

K = Ridge roughness

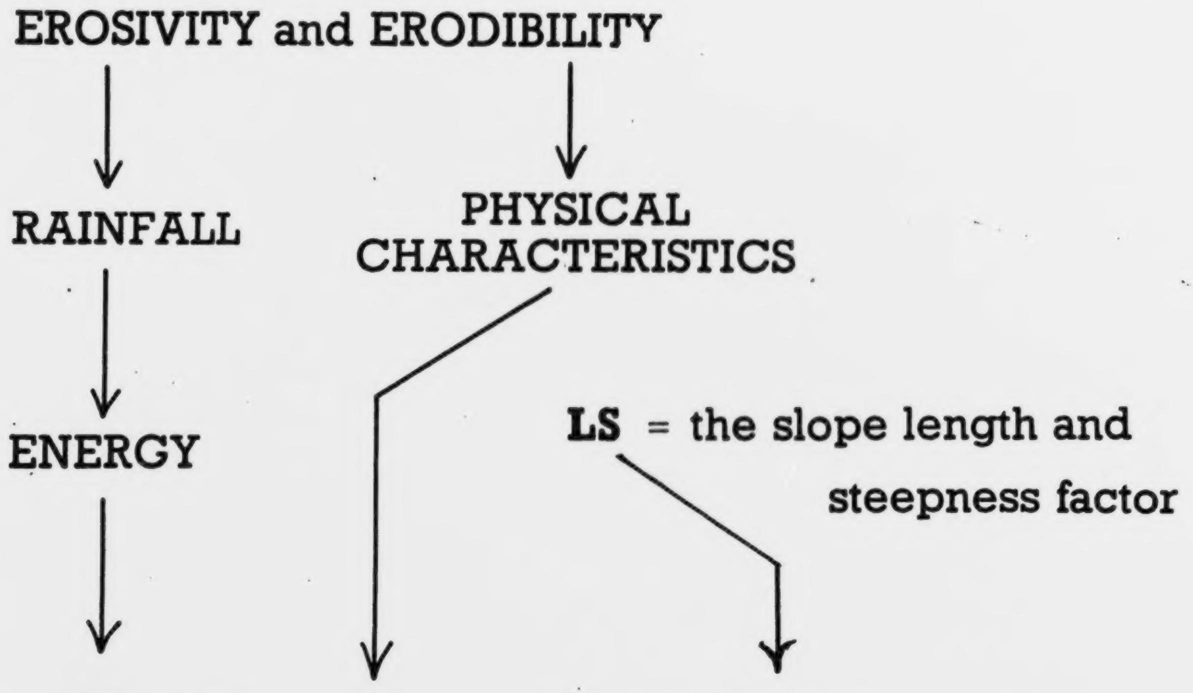
C = Climatic factor

L = Unsheltered distance

V = Vegetative cover

A Soil's Potential To Erode

Erosion is a function of



EROSIVITY and ERODIBILITY

RAINFALL

PHYSICAL CHARACTERISTICS

ENERGY

LS = the slope length and steepness factor

A = R X K X LS

VM-SC-5

Erodibility Index

A. Water Erosion

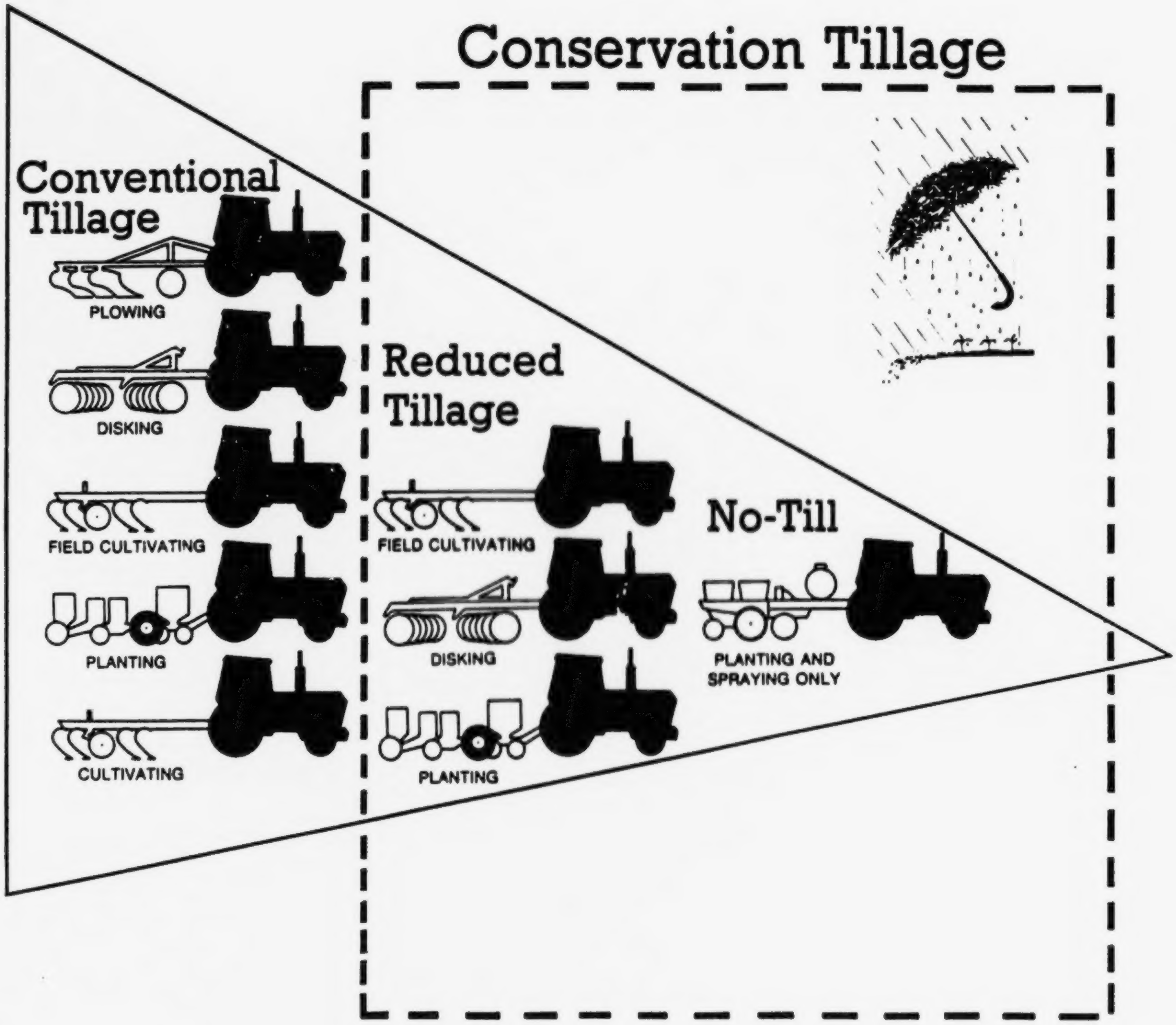
$$\frac{R\ K\ L\ S}{T} \geq 8$$

B. Wind Erosion

$$\frac{C\ I}{T} \geq 8$$

Stay
Eligible
For USDA
Programs

Equipment Tillage Triangle


Conservation Tillage
Conventional Tillage
PLOWING
DISKING
FIELD CULTIVATING
PLANTING
CULTIVATING
Reduced Tillage
FIELD CULTIVATING
DISKING
PLANTING
No-Till
PLANTING AND SPRAYING ONLY

Credit: Adapted from Fundamentals of No-Till Farming. Athens, Georgia: American Association for Vocational Instructional Materials, 1983.

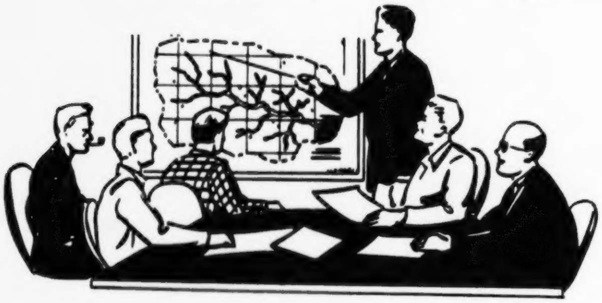
TAKE PRIDE IN AMERICA

Save Our Soil

youth
for
conservation

sponsor →

educational meetings



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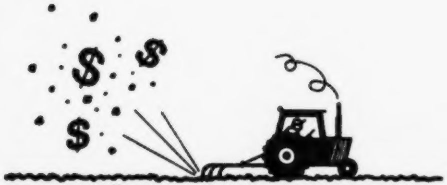
Stay

Eligible

For USDA Programs

← schedule assistance in 1988

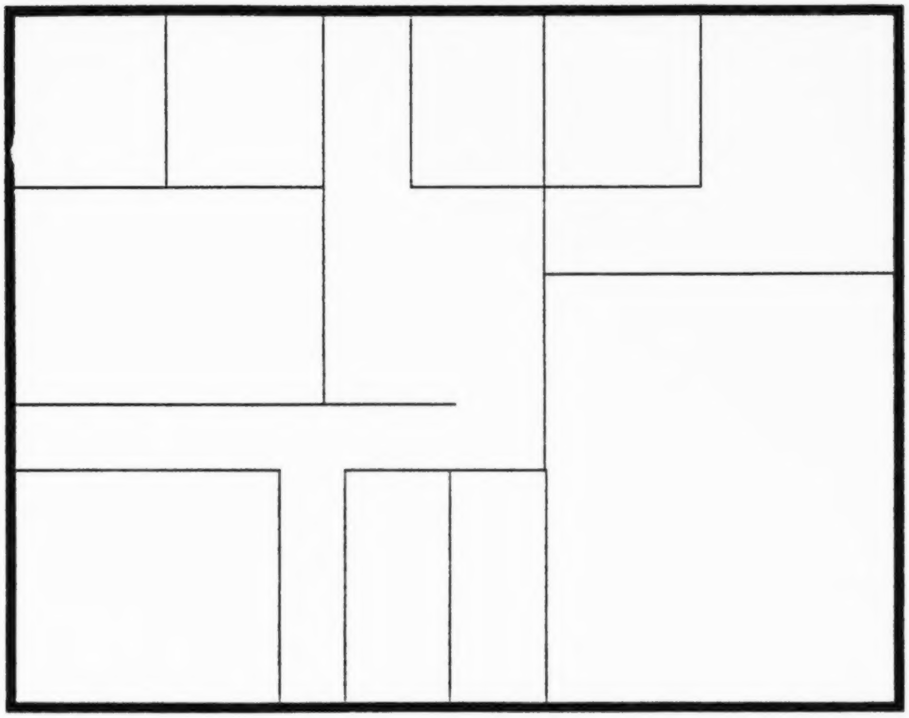


DON'T LOSE YOUR SOIL AND YOUR BENEFITS

WHY DO WE PLAN?

Directions: Arrange appliances and plumbing fixtures, and label each room on the floor plan below.

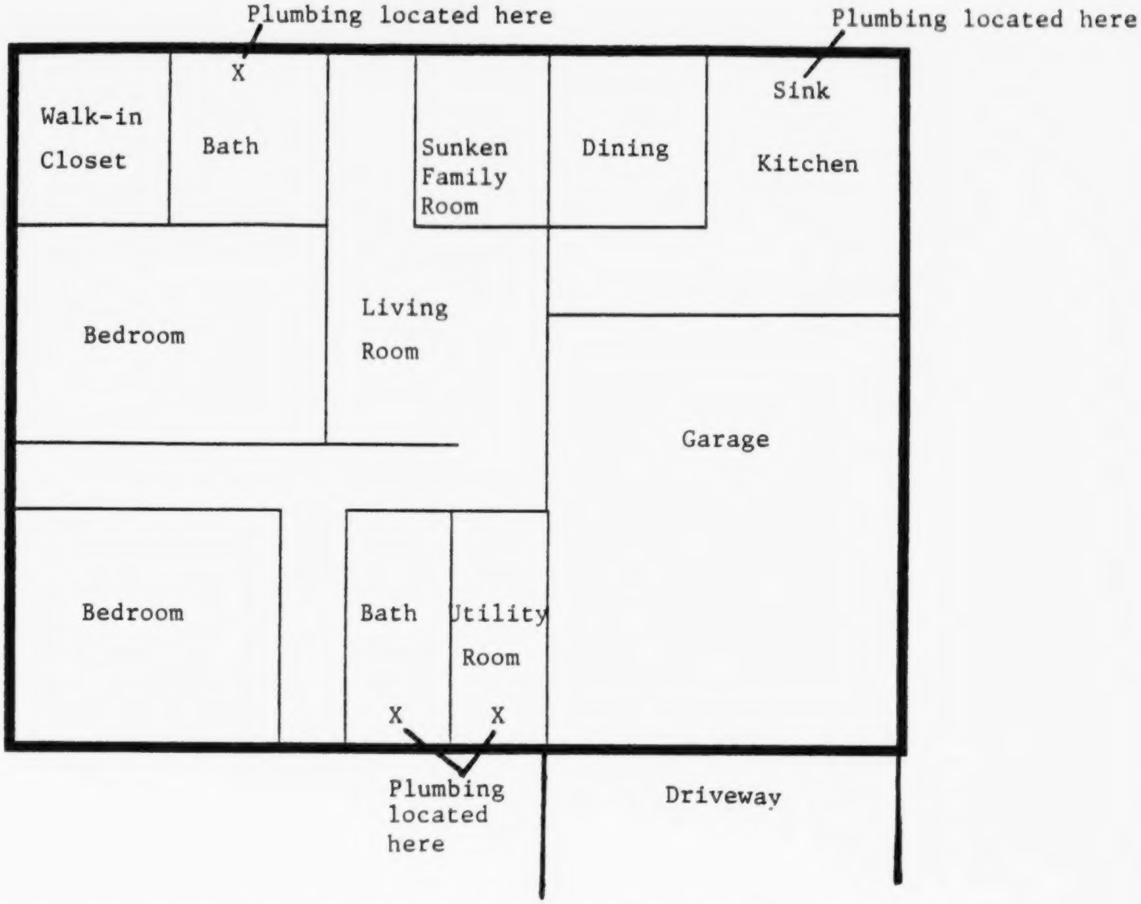
House



WHY DO WE PLAN?

Directions: Arrange appliances and plumbing fixtures, and label each room on the floor plan below.

House


Plumbing located here
X
Plumbing located here
Sink
Walk-in Closet
Bath
Sunken Family Room
Dining
Kitchen
Bedroom
Living Room
Garage
Bedroom
Bath
Utility Room
X
X
Plumbing located here
Driveway

1. Look at your floor plan and see how well you have done in placing appliances and plumbing fixtures in rooms requiring plumbing and an exterior feature, the driveway.

2. In this exercise, you lacked important information (plumbing and location of the driveway) for you to do a good job in planning for room arrangements. Failure to do a thorough job of basic planning can be costly and lead to disappointing results.

3. Gathering basic information is also very important in developing a conservation plan.

Invisible Erosion
(Main points to observe)

1. What is the definition of erosion?

2. Erosion is easy to identify? True or False

3. What is the average soil loss per acre each year in Iowa?

4. What are clues that sheet erosion is taking place?

5. Why is erosion like dipping into a savings account?

Invisible Erosion
(Main points to observe)

1. What is the definition of erosion?

   (To eat away and destroy by slow consumption)

2. Erosion is easy to identify? True or False

   (False, sheet erosion is difficult to see)

3. What is the average soil loss per acre each year in Iowa?

   (10 tons/acre/year)

4. What are clues that sheet erosion is taking place?

   (Silt at the bottom of the hill, lighter colored areas on hillsides)

5. Why is erosion like dipping into a savings account?

   (Once the balance hits zero, we can't bring in new topsoil to start a new account)

Steps in Developing a Conservation Plan

1. Learning

   What kinds of information do you need in order to plan conservation systems for a farm?

2. Evaluating

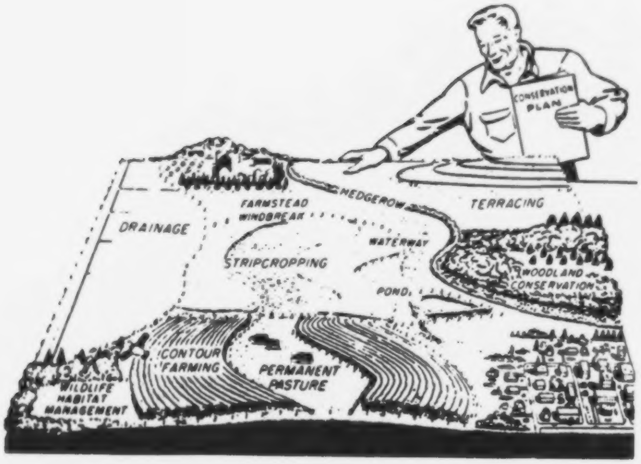
   What kinds of conservation systems are available that the farmer may apply to solve the erosion or drainage problem?

3. Deciding

   Of all the alternative conservation systems available to the farmer, which ones best fit his operations and are within his means?

4. Recording

   Why is it important to record the farmer's decisions?


CONSERVATION PLAN
HEDGEROW
TERRACING
FARMSTEAD WINDBREAK
DRAINAGE
WATERWAY
STRIPCROPPING
WOODLAND CONSERVATION
POND
CONTOUR FARMING
PERMANENT PASTURE
WILDLIFE HABITAT MANAGEMENT

Steps in Developing a Conservation Plan

1. Learning

   What kinds of information do you need in order to plan conservation systems for a farm?

   (Inventory of the soils on the farm. Study soil survey, where are erosion problems? Where are wetness or drainage problems? What kind of farming operation does the farmer want? - grain farming, livestock, etc.)

2. Evaluating

   What kinds of conservation systems are available that the farmer may apply to solve the erosion or drainage problem?

   (Determine whether the erosion problem can be solved with a crop rotation reduced tillage, strip cropping, contouring, grass waterways or will it take terraces plus erosion control structures? Are tile or tileoutlet teraces also needed to reduce both erosion and the wetness problem? Is the farmer interested in developing a wildlife area?)

3. Deciding

   Of all the alternative conservation systems available to the farmer, which ones best fit his operations and are within his means?

   (Decide which systems the farmer prefers to solve his or her erosion and drainage problem. For instance, if the farmer has livestock, a crop rotation, including hay, may be what the farmer decided to use. In addition, the decision to use conservation tillage, which can be low cost, may fit the farmers operation. If erosion is too severe, the farmer may elect to install terraces (some each year, field by field)

4. Recording

   Why is it important to record the farmer's decisions?

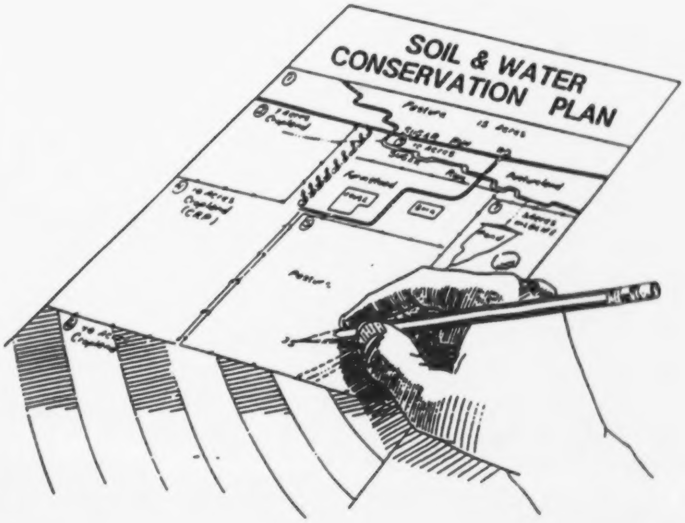
   (To have an orderly plan so that systems are applied first where they are needed most and in proper sequence. This record also helps in scheduling technical assistance, contractors and planning for needed finances)

Get Your
Conservation Plan

If you have highly erodible land on your farm you should make arrangements to develop or up-date your conservation plan.

A **conservation plan** is required by the Food Security Act of 1985 for continued eligibility for many USDA program benefits. It is a written record of conservation practices you plan to install and maintain on your farm.

Start by contacting the local representatives of the **Soil Conservation Service** and your soil and water conservation district. They **will help you develop a conservation plan** and continue eligibility for USDA program benefits.



Developing a conservation plan is a four step process:

- **Learning** all you can about your land and its potential,
- **Evaluating** and comparing alternatives available to you,
- **Deciding** what you will do to control soil erosion on the land you farm, and
- **Recording** your decisions in a conservation plan.

Your **conservation plan** needs to be approved by the local soil conservation district **by January 1, 1990 for continued eligibility** for USDA program benefits. All farmers with highly erodible land will need to review existing conservation plans and, if needed, develop a new conservation plan before the deadline. Soil and water conservation district and Soil Conservation Service staffs are limited, therefore, it will be best to **begin now** to be sure you have an approved conservation plan.

See your Soil Conservation Service field office near you.

Section III.

Natural Resources Activities Handbook

Classroom And Lab

FFA Activities

Supervised Agricultural Experiences

ACKNOWLEDGEMENTS

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PREFACE

Soil and water are recognized as our most important natural resources. The way we manage these resources and their products - plants and animals - is important in determining our present and future welfare.

Conservation and wise use of soil and water on cropland, grassland and woodland are keys to keeping our land productive, our people healthy, and our nation strong and attractive.

Aldo Leopold in Sand County Almanac defined conservation as a state of harmony between people and land. He emphasized that when we see land as a community to which we belong, we will use it with love and respect. He believed that there was no other way for land to survive the impact of mechanized agriculture.

How well we carry out our natural resource stewardship responsibilities depends on all of us, not just the landowners and operators. There must be a universal awareness of the importance of natural resource conservation. The awareness can be developed most effectively by teaching conservation to our youth. Teachers and educational leaders have a vital role to play if we are to be successful in this most important challenge. It is hoped that this Natural Resources Activities Handbook will provide action oriented, hands-on opportunities, which will stimulate an appreciation for natural resources. The goal is a stronger conservation ethic for the future farmers, agricultural leaders and general population.

INTRODUCTION

This Natural Resources Activities Handbook was developed to provide a ready access to hands-on activities in soil, water and other natural resource conservation. The handbook can also serve as a source of ideas for recognition programs and contests in the natural resource conservation field. The information should be useful in two ways: (1) to serve as a guide for the teacher in integrating skills into individual or chapter projects; and (2) to provide students with hands-on activities, contests, and games that will enhance student learning in the soil, water and natural resource conservation curriculum.

The handbook is designed for a loose leaf, 3-ring binder for convenience of removing individual pages to use with appropriate instructional plans and for keeping the contents current.

As an aid to busy teachers, this handbook provides quickly adapted, hands-on activities that can be used as a supplement to on-going instruction. Teachers can modify the activities according to interests or needs of students.

The handbook was made possible through the SCS-ISU Partnership established in July 1987.

Prepared by Eldon C. Weber
U.S. Soil Conservation Service
ISU Liaison

Agricultural Education Department
Iowa State University

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INTRODUCTION TO CLASSROOM AND LABORATORY ACTIVITIES

This unit contains activities that can be used to supplement instructional plans on the subjects of soil, water and other natural resource conservation. The unit is divided into three categories; demonstrations, games and case studies.

The section labeled Demonstrations contains activities that can be used in the classroom, and indoor or outdoor laboratories to demonstrate conservation principles. Activities included in the Games section contain interesting competitive activities or games that can be used to illustrate important natural resource points or stimulate interest and discussion. The Case Study section provides opportunities for group interaction in natural resource career-oriented situations.

This unit will provide quickly adapted hands-on activities that can be used as a supplement to on-going instruction. Natural resource orientation career tasks are identified throughout this section.

CLASSROOM AND LABORATORY ACTIVITIES

A. Demonstrations

1. **WHAT** - Measure a slope (expressed in percent, a performance skill)

WHO - Individual or group of students (Associated careers - Soil Conservationists, Civil or Ag. Engineers)

WHY - To help students understand the concept of percent slope (used in the Universal Soil Loss Equation to determine soil loss)

WHERE - School grounds, a selected field or improvised in the classroom (laboratory)

WHEN - Supportive exercise in teaching erosion control, soil loss, water runoff characteristics, land use, selection of conservation practices, and application of conservation practices (allow 15 minutes, also a performance skill in the FFA contest)

HOW - (Materials: yardstick, carpenter's level, 50" stick)

a. Place a 50" stick horizontally on a slope.
b. Place carpenter's level on the stick, moving the free end of the stick up or down until the bubble is level.
c. With a yardstick, measure the distance from the ground to the free end of the stick.
d. The reading in inches multiplied by 2 gives the percent slope.

This demonstration could be done in the field using:

a. Tape measure, hand level, engineering level or transit, surveying rod or pole with height graduations.
b. Evaluate as to whether the student arrived at the correct percent slope.

2. **WHAT** - Soil Sampling, Texturing, and Productivity (A series of demonstrations)

WHO - Individual, group or class of students (Associated careers: Farmers, Agronomist, Soil Scientist, and Fertilizer Representative)

WHY - To develop an appreciation for soil fertility, soil tilth and the importance of protecting topsoil.

WHERE - Classroom or laboratory

WHEN - Use to introduce a unit on soils and soil conservation principles.

HOW - Have students bring to class a sample of soil from their home (don't give them instructions on where to get the soil, how to take the sample or whether it's topsoil or subsoil). They could bring the sample in a baggy in preference to a jar. The container should be transparent so the student can easily present the sample to the class. In class, ask each student to define soil and then to describe where their sample was obtained, was it from cropland where a herbicide was used which would be damaging to other crops, does it have high clay content, or high organic content, is it course textured and fine textured?

a. Ask students, as a class, to determine which has the darkest color, lighest color, highest clay content (have them check for sand, silt, and clay content using the dampened soil ribbon method)?

   - place a teaspoon of soil in the palm of the hand
   - add water very slowly, drop by drop and as water is added, knead the soil until it has the consistency of moist, workable putty.
   - when the soil is at the proper consistency, try to press it into a ribbon between the thumb and forefinger.

The general description of the results of the demonstration would be as follows:

Sandy Soil - Doesn't make a ribbon (soft clods or single grains when dry)
Silt Materials - Very little ribbon (clods when dry)
Clay Materials - Forms good ribbons and sticky when moist (very hard clods when dry)

b. To demonstrate difference in soil particle size, (soil scientists classify soil particles into sand, silt and clay) place soil in a jar, fill jar with water, shake jar vigorously, and let the soil settle (allow plenty of time for the small particles to settle out). Demonstrate the different layers of (from top to bottom) clay, silt, find sand and coarse sand.

- Soil partical size can also be demonstrated using a basketball, baseball, and a bee bee.
- Ask students which of the balls or bee bee represents the relative size of sand, silt and clay particles.

The Answer:
Sand - Basketball (0.05 to 2.0 millimeters in diameter)
Silt - Baseball (0.002 to 0.05 millimeter in diameter)
Clay - Bee bee (Smaller than 0.002 millimeter in diameter)

- Emphasize the importance of particle size. The amount of open space between particles has a lot to do with how easily water moves through soil and how much water it will hold (Too much clay causes soil to take in water slowly and gives up its water to plants slowly). Loam and silt loam refers to soils that have a favorable proportions of sand, silt and clay (See texture chart, Page 1-2.4).
- Ask students whether sandy or high clay soils would have the greatest risk of groundwater contaminations, and why? Answer: Sandy Soils or clay that drys and cracks.
- Also ask "What effect does soil compaction have on sand, silt and clay?"

To demonstrate that coarse soils have pore spaces that can be filled with finer soils, fill a jar with marbles, pour sand from a measuring cup into the jar of marbles measuring how much sand can be added to the "marbles pore space." Tap the jar as sand is added to fill all pore spaces.

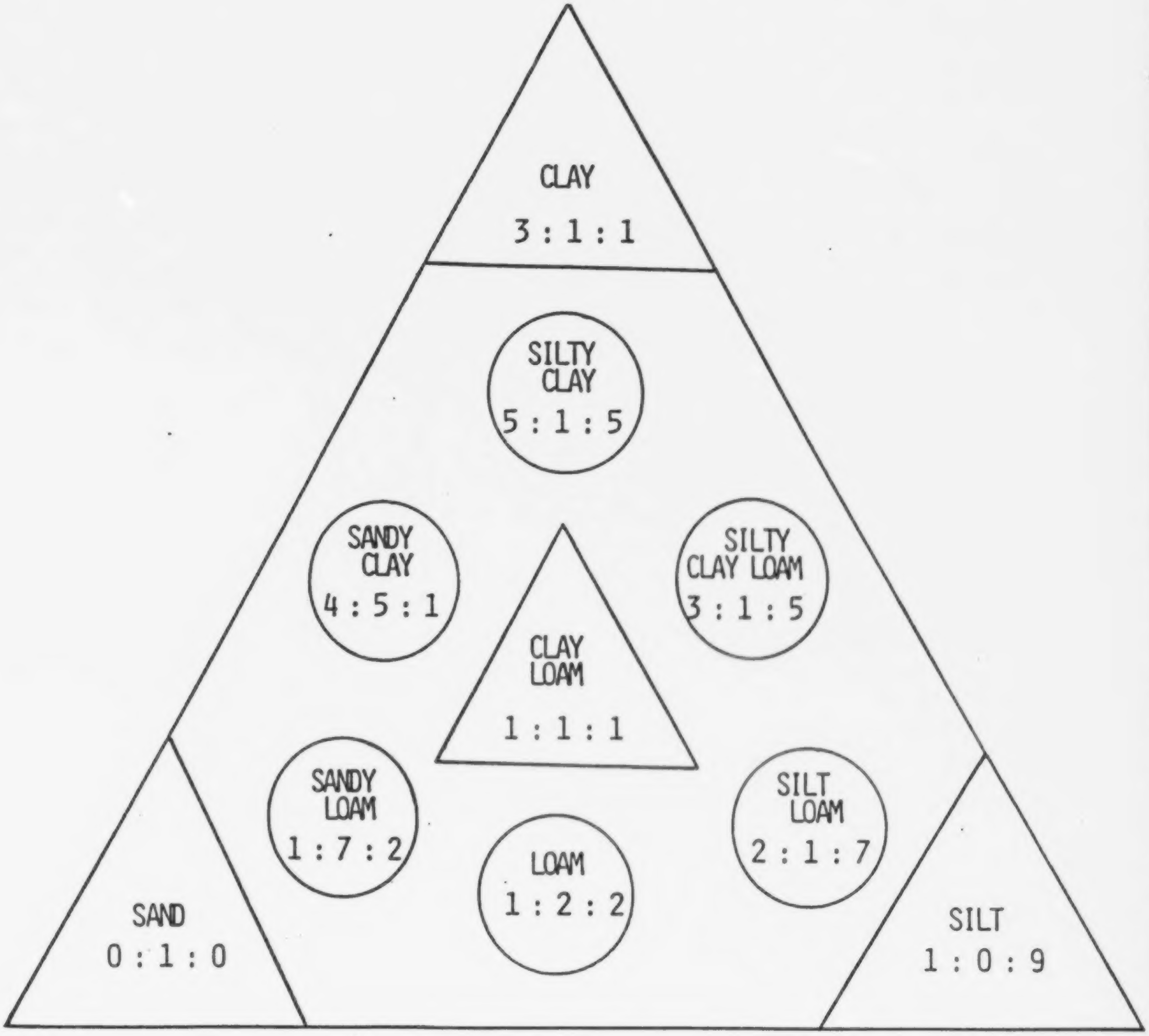
C. The soil can be used to demonstrate plant growth, (use beans or radishes) germination, and difference between plant growth on top soil vs. subsoil, demonstrating productivity loss by erosion and clay, silt and loam comparision. Comparision could be made of germination in soil vs. moist cotton.

- place soil in 8 oz. styrafoam or paper cups with holes punched in the bottom.
- plant 2 or 3 seeds in each cup and place near a light source.
- water each cup every day with 1 teaspoon of water.
- observe the germination of the plants and their growth for 3 to 4 weeks.
- Differences in growth and water needs (based on subsoil, topsoil, or texture) will be evident.
- Discuss advantages of erosion control to protect topsoil.

D. Demonstrate how organic matter helps soil structure. Compare topsoil (could be taken from a fence row) and subsoil (could be an eroded cropland slope). Place a clump of each on a fine screen and lower into seperate measuring cups partially filled with water. Watch what happens. Topsoil organic matter absorbs more water and holds it's shape, subsoil falls apart and drops to the bottom of the jar. Organic matter improves soil tilth, reduces water run-off and improves aeration.

- Compare the organic matter of the student's soil sample with a commercial potting soil mixture.
- Use commercial mix to demonstrate alum test. Fill baby food jar one fourth full with soil, add a pinch of alum (alum will make the organic material separate from the rest of the soil), fill jar with water, cover with lid and shake vigourously, let material in jar settle at least one minute (top layer is organic matter).
- Most of the organic matter in soil is due to the never-ending decomposition of plant and animal residues. Through decomposition, organic matter is converted into simple compounds, such as carbon dioxide, water and nitrate.
- The term "humus" often is applied to organic matter which is in an advanced state of the decay process. Soil organic matter is continually added, decomposed and finally mineralized returning elements to the nutrient cycle. Millipedes, earthworms, grasshoppers and microorganisms assist in the decomposition process. Ask students to analyze their soil sample for these organic processors.
- Decomposition can also be demonstrated in a compost pile.

TEXTURE CHART


CLAY
3 : 1 : 1
SILTY CLAY
5 : 1 : 5
SANDY CLAY
4 : 5 : 1
CLAY LOAM
1 : 1 : 1
SILTY CLAY LOAM
3 : 1 : 5
SANDY LOAM
1 : 7 : 2
LOAM
1 : 2 : 2
SILT LOAM
2 : 1 : 7
SAND
0 : 1 : 0
SILT
1 : 0 : 9

RATIOS ARE PARTS CLAY : SAND : SILT

A. Demonstrations

3. **WHAT** - Natural Resource Values (Apple Demonstration)

WHO - Class of students (Associated Careers - Farmers, Soil Conservationist, Soil Scientist, land use planners and society in general)

WHY - To give students an appreciation for the soil and water resources

WHERE - Classroom or laboratory

WHEN - Could be used in introducing a unit on Soils - Instructional Module, "The Connection Between Soil Erosion and Soil Productivity"

HOW - Often forgotten in the race for higher yields per acre are the underlying basics of soil science. This unit deals with the science of a vital ingredient, land or soil as the foundation of life.

Use VM-LAND-1, Page 1-2.6, to generate a discussion on natural resource values. What does this pledge mean to you?

Demonstration: (To illustrate what a small percentage of the earth's surface is made up of productive soil.)

1. Cut an apple in four equal parts, three parts represent the oceans of the world. The fourth part represents land.

2. Cut the land (one-fourth) in half equally - one-eight. One represents deserts, mountains, swamps, and arctic. The other one-eighth represents land where people live but may not grow food.

3. Slice this one-eight section crosswise into four equal parts. Three of these one-thirty seconds section represents areas of the world which are too rocky, too wet, too hot, or where soils are too poor for production, as well as areas developed by people.

4. Peel the last one-thirty second section. This small bit of peeling represents the soil of our earth on which people depends for food production. It is the responsibility of each generation to use the soil wisely to provide for future generations as only seven percent of the earth's land surface is suitable for agriculture.

Most people don't take time to reflect on what a quality life means. What does a quality life mean to you and does land or soil play a part? Social, spiritual, and family values are important in a quality life, but what about soil resources?

PLEDGE

I give my pledge as an American to save and faithfully to defend from waste the natural resources of my country---its soil and minerals, its forests, waters, and wildlife.

WHAT DOES THIS PLEDGE MEAN TO YOU?

A. Demonstrations

4. **WHAT** - Perspective on Diminishing Soil Resource

WHO - Class of students (Associated Careers - Farmers, Soil Scientist, Soil Conservationist, Agronomist and Society in general)

WHY - To give students a perspective on the limited soils resource and it's diminishing productivity through erosion.

WHERE - Classroom or Laboratory

WHEN - Could be used in introducing a unit on soils - Instructional Module, "The Connection Between Soil Erosion and Soil Productivity"

HOW - With a handful of topsoil in your hand (over a container), proceed with the demonstration. Ask students, if this handful of soil represents the earth's surface,how much should I remove that represents oceans, rivers and lakes? Answer: Three-fourths (3/4). Allow three-fourths of the soil to fall into a container. Now of this one-fourth (1/4) left in my hand, how much represents deserts, glacial poles, and mountain peaks? Answer, one-half (1/2), so let one-half (1/2) of the remaining soil drop in the container. Now drop one-tenth (1/10) of what's left and say, "this is the land used for cities, towns, houses, roads, etc. What's left in your hand is all we have to support life on earth, and this soil is trickling through our fingers at an alarming rate due to unchecked erosion. Let remaining soil trickle into container.

A. Demonstrations

5. **WHAT** - Force of the Raindrop and Soil-Plant Relationship Visual Masters

WHO - Class of students (Associated Careers - Farmers, Soil Scientist, Soil Conservationist, Agronomist and Society in general)

WHY - To give students an appreciation for erosion and soil productivity connection

WHERE - Classroom

WHEN - Could be used to introduce a unit on soil erosion - Instructional Module "The Connection Between Soil Erosion and Soil Productivity"

HOW - a. Use an overhead projector to show VM-PROCESS-1, Page 1-2.9, Visual Master and generate a class discussion on the impact of the raindrop and how we can nullify that impact with a cover.

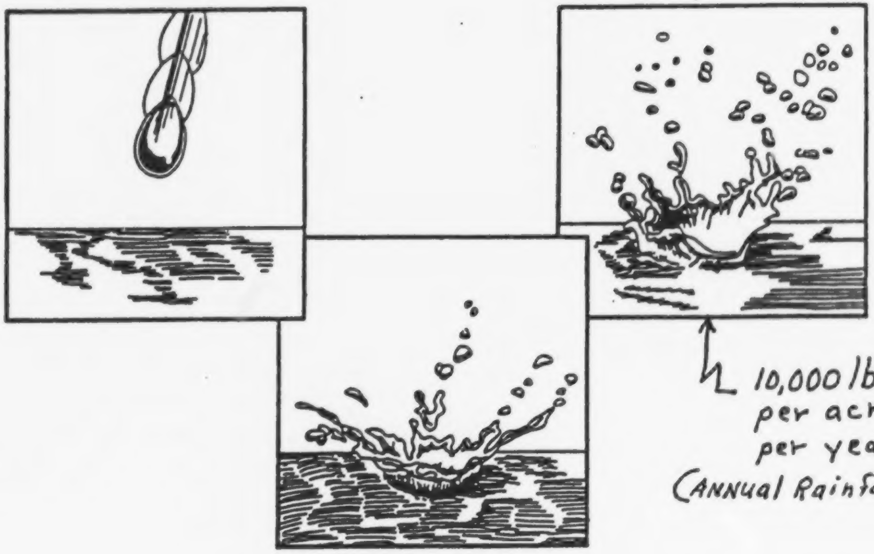
b. Use VM-EROS-1, Page 1-2.91, to continue the class discussion on the affects of soil erosion; and plant growth and productivity.

VM-PROCESS-1

FORCE OF THE RAINDROP

WHAT IS ITS AFFECT ON THE SOIL SURFACE?

WHAT CAN WE DO IN CROP PRODUCTION TO REDUCE THE FORCE OF THE RAINDROP?

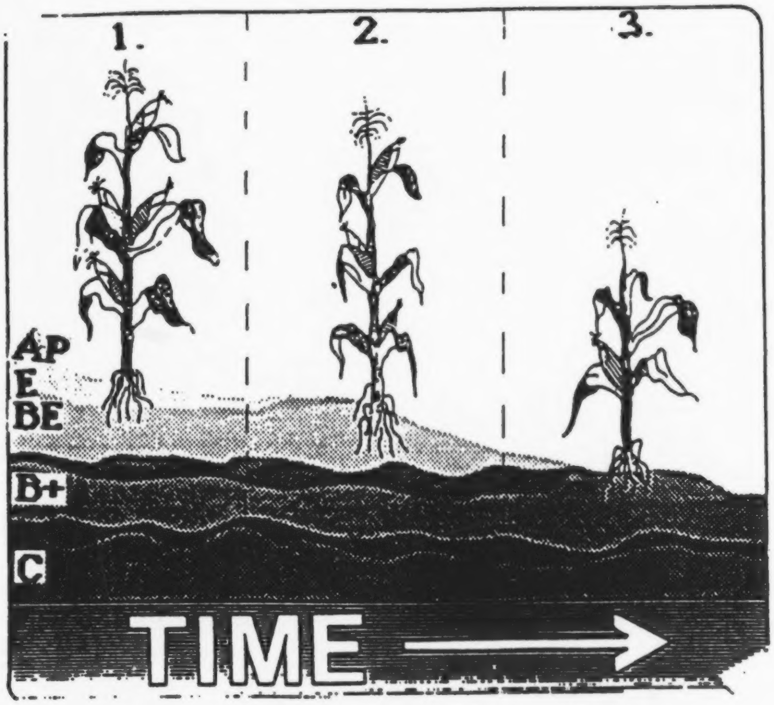


10,000 lbs. TNT
per acre
per year
(ANNUAL Rainfall Impact)

Control the Splash with Conservation Tillage

VM-EROS-1

SOIL-PLANT RELATIONSHIP



1. WHAT DIFFERENCES DO YOU SEE IN THESE THREE CORN PLANTS?

2. WHAT CONDITIONS DO YOU SEE THAT WOULD CAUSE A DIFFERENCE IN NUMBERS OF EARS AND PLANT GROWTH?

3. DO YOU KNOW OF FIELDS IN YOUR AREA WHERE PLANTS SHOWN IN 2 AND 3 ABOVE ARE EVIDENT?

CLASSROOM AND LABORATORY ACTIVITIES

B. Games

1. **WHAT** - Public Service Announcement - Food Security Act

WHO - Individual students or groups (groups would take less classroom time), (Associated Careers: Radio or TV Announcer or Producer, Journalist, Advertising or Sales Representative)

WHY - To add some interest and hands on experience in appreciating the implication of the 1985 Food Security Act and the importance of this skill in the named careers.

WHERE - Classroom, radio or TV station

WHEN - Will serve as a student participation activity as a supplement to teaching How to Stay Eligible Through the 1985 Farm Bill (This activity can be adapted to other subjects), (Allow 15 to 20 minutes for student preparation and 2 minutes for each presentation - 10 minutes for class evaluation)

HOW - Materials (paper and pencil; optional-use school video camera and make tapes). Use the fact sheets "Conservation Provisions" in reference section of this notebook.

a. Ask students to write a one minute public service announcement to be aired on radio or on the topic "Get a Conservation Plan to Stay Eligible for USDA Programs."
b. Have students present their PSA to the class and have the class vote on their favorites. If a video camera is used, replay video to show students how effective they were. Consider using the best PSA on radio or TV.
c. Evaluate on the basis - is it innovative?
   - does it carry the correct message?
   - will it catch the public's attention?

(This activity could be adapted to a news article, feature story, or TV presentation)

B. Games

2. **WHAT** - Team Competition "Eligibility in Jeopardy - Food Security Act"

WHO - Two teams (Associated Careers - Soil Conservationists, Policy Makers and Extension Specialist)

WHY - To stimulate interest and have fun in teaching conservation provisions in the 1985 Food Security Act.

WHERE - Classroom

WHEN - In conjunction with Teaching the Conservation Provisions of the Food Security Act (Instructional plan included in this handbook)

HOW - Divide the class into two teams, flip or draw for order of play. Players pick topic areas and difficulty values (individual effort required on each question). If an individual answers the question correctly, the team is awarded the corresponding point value of the question. If answered incorrectly, the opposing team has 10 seconds as a group to answer for the corresponding point value for the correct answer. Play alternately between teams each time a new question is to be drawn. The team with the most points in a given amount of time wins. (Use the accompanying fact sheets for reference)

Sample Questions

5 point value

1. Two conservation provisions of the 1985 Farm Bill are?

   Key: Conservation Reserve, Conservation Compliance, Sodbuster, Swampbuster.

2. The Conservation Reserve Program requires land to be retired for: (a) 5 years, (b) 10 years, (c) 15 years

   Key: (b) 10 years

3. A conservation plan must be developed on highly erodible land by January 1 of which year to remain eligible for USDA Programs? (a) 1995, (b) 1992, (c) 1990

   Key: (c) 1990

4. In using the USLE to determine Highly Erodible Land (HEL), name two factors used in the equation.

   Key: Any two of the following: rainfall, soil erodibility, slope length, steepness of slope and "t" value or tolerable limit.

10 point value

1. Swampbuster applies if you convert naturally occuring wetlands to cropland after what date?

   Key: December 23, 1985

2. To remain eligible for USDA programs, if you plow out highly erodible land, what must you do?

   Key: Do so under an approved Conservation System

3. Name three USDA programs that you will be ineligible for if you don't qualify for the Food Security Act?

   Key: Any one of the following: price and income supports, crop insurance, FMHA loans, CCC Storage Payments, Storage facility loans, and Conservation Reserve Annual Payments.

4. When must conservation systems be applied to Highly Erodible Land (HEL) to remain qualified for USDA programs?

   Key: By January 1, 1995

3. **WHAT** - Who's responsible for erosion? (Debate)

WHO - Three teams or more (Associated Careers - Farmers, Soil Conservationists, Policy Makers and Society in general)

WHY - To raise the consciousness of students in the need for taking responsibility in ensuring sustainable resources

WHERE - Classroom

WHEN - In conjunction with teaching soil conservation

HOW - Use ACT OFF-SITE-2 in team debate activity and KEY-ACT-OFF-SITE-2 for a guide to debate topic areas.

WHO'S RESPONSIBILITY?

Divide into teams for debating the following issues:

WEIGHT THE ISSUES

Team 1: Be prepared to discuss:

A. Why the farmer should be responsible in controlling soil erosion from leaving the farm.

B. Why the taxpayers should not have to pay the costs of repairing damages caused by sediment.

C. At the conclusion of the debate, cooperatively decide who benefits, how costs might be divided and what are possible sources of funds.

Team 2: Be prepared to discuss:

A. Why the farmer should not be responsible in controlling soil erosion from leaving the farm.

B. Why the taxpayers should pay the costs of repairing damages caused by sediment.

C. At the conclusion of the debate, cooperatively decide who benefits, how costs might be divided and what are possible sources of funds.

Team 3: Judge the debate, and declare the winning team based on their use of factual information and final conclusions on a cooperative approach, where farmers and society in general could benefit.

KEY-ACT-OFF-SITE-2

WHO'S RESPONSIBILITY?

ANSWER:

There is no one answer, as each should share some of the burden. Some would say the individual should control erosion within the tolerable level (level at which top soil develops) and society should deal with the balance. Principles should be addressed such as the importance of stewardship, conservation pays, and society benefits from a strong economy enhancing the environment for the health and welfare of present and future generation. A discussion on the justification of state and federal cost sharing and the Food Security Act benefits should enter into the discussion.

Point out the need for a good educational program, to avoid pitting farmers against society in general, so everyone recognizes it is essential to have a cooperative effort.

Questions to discuss might be:

Should soil conservation programs remain voluntary?

Who should pay for soil conservation work?

How much involvement should federal and state government have in soil conservation programs?

CLASSROOM AND LABORATORY ACTIVITIES

C. Case Studies

1. **WHAT** - Opinion Survey - Students vs. Adults (comparison to Cooperative Extension Service Publication "Iowa Farm and Rural Life Poll, 1987 Summary," PM 1298, August 1987).

WHO - Individual Students (Associated Careers - Economist and Sociologist, Extension Specialist)

WHY - By comparing opinions of students to farmers it will open up some interest and stimulate a discussion on why the similarities or differences between the student's and farmer's opinions. It will provide an opportunity to relate to careers.

WHERE - Classroom

WHEN - Can be used as a strategy to develop interest in the subjects of soil conservation, conservation tillage and farm programs (allow 60 minutes)

HOW -

a. Tell the students that Iowa State University Extension Service conducted a survey among farmers in Iowa in 1987 on various topics of agriculture, farm policy and soil conservation.
b. Inform them, that in this exercise they will serve as a USDA policy maker in Washington, DC. Instruct them to answer the survey questions based on their present knowledge and be prepared to defend their answers in comparison to the farmer's answers.
c. Get a composite scoring for the class by asking students to raise their hands as questions and choices of answers are read (Place answers on the blackboard).
d. Have a class discussion comparing their answers to answers in the farmer's survey.
e. Students could conduct a similar poll getting local farmers, soil and water conservation district commissioners, or SCS officials opinions for comparison.
f. The student and farmer opinion survey follows:

STUDENT OPINION SURVEY

Instructions: Read each question carefully. After each question place an X under the column that most nearly describes your opinion.

Strongly Support - SS
Somewhat Support - SWS
Uncertain - UC
Somewhat Oppose - SWO
Strongly Oppose - SO

	SS	SWS	UC	SWO	SO
1. To receive government payments, farmers with erodible soils must have an approved conservation plan implemented by 1995.					
2. By 1998, the Government should eliminate all price supports, production reduction programs, and government storage.					
3. Develop domestic markets for U.S. farm products and de-emphasize international trade as a solution to low prices.					
4. Biotechnology will enable farmers to become less dependent upon agriculture chemicals.					
5. Biotechnology will help solve the problem of farm surpluses by finding new uses for crops and livestock.					

Considerable Advantages - CA
Moderate Advantages - MA
Almost the Same - AS
Moderate Disadvantages - MD
Considerable Disadvantage - CD
Unsure - US

	CA	MA	AS	MD	CS	US
6. In your opinion, what are the advantages of conservation tillage for the following?						
a. Wind erosion						
b. Soil erosion due to water run-off						
c. Fuel required						
d. Time spent in field						
e. Moisture conservation						
f. Soil compaction						
g. Overall profitability						
h. Weed control						
i. Insect control						

SUMMARY OF FARMER'S ANSWERS
OPINION SURVEY

Iowa Farm and Rural Life Poll, 1987
Extension Bulletin PM1298, August 1987

Strongly Support - SS
Somewhat Support - SWS
Uncertain - UC
Somewhat Oppose - SWO
Strongly Oppose - SO

	SS	SWS	UC	SWO	SO
1. To receive government payments, farmers with erodible soils must have an approved conservation plan implemented by 1995.	42%	30%	11%	9%	8%
2. By 1998, the Government should eliminate all price supports, production reduction programs, and government storage.	16%	16%	29%	20%	19%
3. Develop domestic markets for U.S. farm products and de-emphasize international trade as a solution to low prices.	26%	40%	20%	10%	4%
4. Biotechnology will enable farmers to become less dependent upon agriculture chemicals.	54%	28%	15%	2%	1%
5. Biotechnology will help solve the problem of farm surpluses by finding new uses for crops and livestock.	35%	28%	28%	4%	5%

Considerable Advantages - CA
Moderate Advantages - MA
Almost the Same - AS
Moderate Disadvantages - MD
Considerable Disadvantage - CD
Unsure - US

6. In your opinion, what are the advantages of conservation tillage for the following?

	CA	MA	AS	MD	CS	US
a. Wind erosion	64%	29%	6%	0%	0%	1%
b. Soil erosion due to water run-off	65%	27%	6%	1%	0%	1%
c. Fuel required	44%	44%	10%	1%	0%	1%
d. Time spent in field	43%	44%	11%	1%	0%	1%
e. Moisture conservation	30%	54%	12%	2%	0%	2%
f. Soil compaction	26%	48%	17%	5%	2%	2%
g. Overall profitability	15%	44%	32%	4%	1%	4%
h. Weed control	3%	8%	33%	39%	15%	2%
i. Insect control	1%	5%	31%	43%	15%	5%

C. Case Studies

2. **WHAT** - Prepare an Answer to a Concerned Farmer (1985 Food Security Act)

WHO - Individual Students (Associated careers - Soil Conservationist, Extension Service Agriculturist)

WHY - By placing the student in a hypothetical role as a professional, it should stimulate interest in researching the topic, in preparing a written answer to questions on the Farm Bill.

WHERE - Classroom or individual time outside the classroom.

WHEN - In conjunction when teaching the Conservation Provisions of the Food Security Act (allow 60 minutes).

HOW -

A. Explain the setting to the students, that they are (individually) to play the role of A. Lot, the District Conservationist, U.S. Soil Conservation Service. They have received a letter (attached) from a farmer I. M. Questioning, concerning the 1985 Food Security Act.

B. As District Conservationist, they are to prepare a letter in answer to the farmer's questions.

C. Evaluate answers in class stimulating discussion (Refer to the Food Security Act Instructional Plans for correct answers).

RR 1
Eroding Hill, IA

K. A. Lot
District Conservationist
Anywhere, IA

Dear K. A. Lot:

I am concerned that I will not qualify for U.S.D.A. programs because of the 1985 Farm Bill. I would appreciate any advice you could give me in answer to the following questions:

1. Who should I contact to learn more about the program?
2. Will I be able to tile drain the wet field that I have been cropping for the last 10 years?
3. Will I have to build terraces on my sloping fields?
4. How can I qualify for future U.S.D.A. programs?

I'll appreciate any help you can give me.

Sincerely,

I. M. Questioning

C. Case Study

3. **WHAT** - Land Use Planning (Using Soil Survey Report)

WHO - Small groups of students for problem solving (Associated Careers - Farmer, Land Developer, Soil Scientist, Soil Conservationist, Landuse Planner, Agronomist, and Extension Specialist)

WHY - To give students an appreciation for the potentials and limitations of soils for various uses of land.

WHERE - Classroom or in the field

WHEN - In conjunction with a unit on soils, soil survey or soil judging

HOW -

A. Place students in groups

B. Ask each group to locate the same preselected 80 acres of land in the county soil survey report. (Use Table of Contents to locate Soil Survey Maps and Tables). Use the general soil map and index to map sheets to locate the 80 acre parcel of land to be used in the case study).

C. Ask Group 1 to arrive at recommendations for using the 80 acres for developing building sites. (Refer to the table labeled "Building Site Development). Their recommendations should include answers to:

   1. What areas of the parcel could be used for houses with basements; commerical buildings; streets and roads; and lawns and landscaping with only slight soils limitations? What areas would have severe soil limitations for these uses and why?

D. Ask Group 2 to evaluate this same parcel of land for wildlife habitat. (Refer to the table labeled "Wildlife Habitat).

Recommendations from group two should include answers to:

1. What areas of this parcel of land would have good potential for: grain and seed crops, hardwood trees and wetland plants; and what areas would have only fair, poor or very poor potential for these same uses?

E. Ask Group 3 to evaluate this 80 acre parcel for high and low potential for crop production. (Refer to the table in the report labeled Yields Per Acre of Crops and Pasture).

Recommendations from the group should include answers to the following:

1. What areas have the highest and lowest potential for raising corn, soybeans, oats and smooth bromegrass? What acres would be most desirable for rowcrop and what areas are most desirable for pasture?

F. Ask the groups to make a report on their findings. Ask for discussion answering the following questions:

1. Which of the three land uses would be best suited on this 80 acres of land?

2. Where should field divisions be placed to separate one land use potential from another potential or from areas that have severe limitations?

C. Case Study

4. **WHAT** - Land Use Planning on an Undeveloped Island

WHO - Small groups of students for problem solving (Associated Careers - Land Developer, Land Use Planning, Soil Conservationist, Agronomist)

WHY - To stimulate interest in appreciating the fact that soil and land differs in it's capability, uses and needed treatment.

WHERE - Classroom

WHEN - Could serve as an introduction to soils

HOW -

a. Place students in groups and hand out ACT-LAND-1 for their problem solving.

b. Ask for group reports

C. Use KEY ACT-Land-1 as a guide for answers.

IOWLAND

GROUP TASKS:

1. Select a group leader to lead discussion and a recorder to take notes.

2. Situation:

   You and a few other key leaders have been sent to an island called "Iowland" to develop a land use plan. This can be likened to when our ancestors came to America. This country was inhabited by American Indians. "Iowland" is inhabited, but the island has not developed agriculturally. Your assignment is to decide how the land on "Iowland Island" (approximately 36 million acres) can best be used to provide for a quality life for the inhabitants and future citizens of the island. The climate and land of Iowland is similar to Iowa as it existed in 1700.

   This island's land is made up of a variation of soils as follows:

   A. 12 million acres of good productive soil covered with prairie grass.
   B. 14 million acres of soil, relatively productive, but with steeper slopes covered with scattered trees and grass.
   C. .5 million acres of wetland scattered throughout the North Central part of the island covered with wetland plants.
   D. 10 million acres, which is not very productive because of steep slopes or shallow topsoil over bedrock or a rocky surfact covered with trees.

   As a group, answer the following:

   a. Should all the soils on the island be used for crop land, and if not, why not?
   b. What are your general recommendations to the citizens of Iowland on how the land should be managed to provide for quality life for present and future generations? Consider the following needs norally associated with quality of life: food, energy, shelter, transportation and wildlife.

3. The group leader should be prepared to report on the group's plan.

KEY ACT-LAND-1

IOWLAND

A. **Should all the soils on the island be used for crop land and if not, why?**

At a minimum, answers should include the following:

No. It is obvious that not all soils are suited for crop land. Soils on steep land and wetlands should not be used for crop land. Soils that are shallow to bedrock should not be used for cropland.

Why? Soils on steepland are too erosive when used as crop land contributing to soil deterioration. Soils on wetland will be too difficult to farm. Soils that are shallow to bedrock, if allowed to erode, will become unproductive for any useful purpose.

B. **What are your general recommendations to the citizens of Iowland on how the land should be managed to provide for a quality life for present and future generations?**

At a minimum, answers should include the following:

Soils that are not found on wetlands and steeplands can be farmed using conservation systems to prevent soil erosion and water pollution.

Soils that are found on steeplands should be left in grass and trees and plans developed to properly manage grass and trees for food, upland wildlife, and fiber production.

Soils found on wetland should be protected and developed for water wildlife.

With this type of good land management we can enjoy good food, land and water types of recreation, and a scenic environment.

Other answers might include recommendations for locating home sites, which should exclude flood plains for building purposes.

Develop a good discussion on the benefits of good land use in using and treating soil within it's capability for a sustained quality of life for present and future generations.

C. Case Study

5. **WHAT** - Biotechnology - A Step Forward or Backward?

WHO - Small groups of students for problem solving (Associated Careers - Research, Agronomy, Agriculture Business).

WHY - To generate interest in evaluating the pros and cons of biotechnology.

WHERE - Classroom

WHEN - Could serve as an introduction to crop production, water quality or agribusiness.

HOW -

A. Divide into groups for debating the following issues:

Group 1: Prepare reasons why biotechnology in plants should not be developed, due to the potential of changing the climate, upsetting the balance of nature, and developing plants that can't be eradicated.

Group 2: Prepare reasons why biotechnology in plants should be developed because it will help raise yields, will reduce undesirable chemicals that cause environmental problems and will reduce costs in crop production.

Group 3: Listen to the debate and develop a consensus of opinion by weighing the issues presented by each group.

6. Case Study

WHAT - Ding Darling Project Materials - 10 modules (Cooperative Extension Service)

WHO - Individual or groups of students (Associate Careers - Soil Conservationist, Agronomists, Wildlife Biologists, Land Use Planners, Policy Makers).

WHY - To stimulate interest in the conservation of soil, water and wildlife.

WHERE - Classroom and field

WHEN - Could be used as an introduction to soils, water and wildlife conservation.

HOW -

(Ding Darling Project)
Excellent teaching materials for grades 5-8 are included in "The 4-H Ding Darling Project," developed by Jim Pease, Iowa Cooperative Extension Service and available through Heartland Education Agency, 6500 Pioneer Parkway, Johnston, Iowa, 50131, at a cost of $25 plus mailing costs for in-state. Some of the materials would be very useful in vocational agriculture to develop an appreciation for natural resources (see accompanying pages for more detail). Following are examples of Ding Darling activities that might be appropriate in supporting soil, water and natural resource instructional plans:

A. Find something that has been eroded and describe how that thing feels.

B. Dig a hole, then put the soil back in it's original position. Is it easy or hard to do?

C. Make some soil using rocks, gravel, leaves, twings, clay, sand, and silt. Grow a plant in it.

D. Find out how many acres of Iowa land are in intensive row cropping (corn, bean rotation) as compared to total acres. Does this surprise you?

E. Find wood turning to soil. What might be causing this?

F. How acidic is your soil at home? What might be causing this?

G. Prepare and give a talk on the importance of the County Soil Survey. Using the soil survey report determine whether the land at your home is being used appropriately. The following was recognized by Aldo Leopold. When we see land as a community to which we belong, we may begin to use it with love and respect. He believed that there is no other way for land to survive the impact of mechanized agriculture.

H. Have students compile a master list of the four major land uses or activities affecting Iowa groundwater. Have each group choose one activity and research:

   1. What is the activity?

   2. Where it occurs in Iowa?

   3. What effects it could have on an areas groundwater?

   4. Name two alternative plans to insure that an activity will not affect groundwater.

   5. How many Iowans obtain their drinking water from wells?

   6. What is Iowa's groundwater status? What is it's purity and abundance?

   Experiment with different soil textures to determine the most effective groundwater filter. Try sand, silt, clay or loom, or a mixture of the three.

INTRODUCTION TO SUPERVISED AGRICULTURAL EXPERIENCES

Unit II is designed to stimulate interest in soil, water and other natural resource activities that can be included as supervised agricultural experiences. The unit is divided into three sections; Ag. Skills, Improvement Projects and Production Enterprises (ownership and placement).

The Ag Skill section contains a description of individual skills that students can develop in the areas of soil, water and other natural resources conservation. Some of the skills qualify for FFA performance skills in FFA contests.

The Improvement Project section contains conservation oriented activities available for students to undertake in carrying out improvement projects. Ownership or placement productive enterprises associated with the natural resource field are included in the Production Enterprises section.

This unit can be used to not only provide guidance for individual skills, projects and enterprises, but also to illustrate how the supervised agricultural experiences can be integrated into a community development (Building our American Communities) chapter project.

SUPERVISED AGRICULTURAL EXPERIENCES

A. Ag. Skills

1. **WHAT** - Publicize the 1985 Food Security Act

WHO - Individual student (could be a part of a chapter BOAC project).

WHY - To develop an understanding of the four conservation provisions.

WHERE - In conjunction with teaching a unit on Food Security Act.

HOW -

a. Develop and present a 5 minute presentation on (1) Conservation Reserve Program, (2) Sodbuster Program, (3) Swampbuster Program and (4) Conservation Compliance so that the listener would have an awareness of the important requirements of each conservation provision.

b. Evaluate, based on USDA fact sheet "Conservation Provisions" and brochure "How to Stay Eligible for USDA Programs" (available form SCS offices). The video program may also be used, (contained in "Soil Conservation and Ag Respiratory Hazaard Series Tape included in the 1988-89 IVATA instructional materials packet).

c. Evaluate by asking: Is the presentation factual, interesting, were appropriate visuals used, and were objectives achieved?

d. A video camera could be used to develop a tape for future use or to advise the student of strong and weak points.

SUPERVISED AGRICULTURAL EXPERIENCES

A. Ag Skills

2. **WHAT** - Measuring Crop Residue on the Land (A performance skill)

WHO - Individual students or teams of 2 or 3 (Associated careers - Farmers, Agronomist, Soil Conservationist, and Extension Service Agriculturalist)

WHERE - In a cropland field with corn or soybean residue from last year's crop.

WHEN - Early Spring through the planting season.

WHY - To determine the "C" factor in the USLE equation (for estimating soil loss)

HOW - (Materials needed - 50' tape measure, paper and pencil)

a. Stretch a 50' tape out diagonally across corn or bean rows (lay the tape on the ground).
b. Standing directly above the tape (beginning at the 6 inch mark, walk the tape, counting 1 for each piece of residue found lying under the 1/2 foot and whole foot marks. Don't count if there is no residue under these marks (every 6 inches). For example, under the 6" mark is a piece of residue, under the 1 foot mark is residue and under the 18" mark there is no residue (The count at that point would be 2). Count the residue under the marks every 6 inches throughout the length of the 50' tape. Your count (total number) would be the percent residue cover over that area.
c. Repeat the procedure twice more in different locations.
d. Record the count at each of the three locations and take an average of the three to use as the percent residue cover for that field.
e. Since much of the erosion takes place in the spring of the year after crops are planted, it is important to estimate the percent cover after planting. In Iowa, 50% to 60% of the erosive rainfall occurs between April 15 and July 31. Using the attached sheet, have students make an estimate of residue cover remaining after using a typical tillage and planting system.
f. As an example (1) by leaving 20% residue after planting in corn residue, soil losses will be reduced approximately 80%, (2) by leaving 50% residue after planting in corn residue, soil losses are reduced approximately 90%, (3) by leaving 20% residue after planting in soybean residue, soil losses are reduced approximately 66%.

Estimating and Measuring Crop Residues

The more the soil surface is covered with crop residues, the better the erosion control. The critical time to maintain good residue cover is in the spring, until a crop canopy covers the soil. Percent ground covered by residue can be estimated or predicted by tillage operations, or actually measured after planting.

Estimating Residue Amounts

Each tillage operation buries some residue. A rough estimate of the cover remaining with a tillage and planting system can be predicted by multiplying the percentages in the following table for each operation.

Percentage Cover Remaining

Tillage Tool	Remaining Cover Factor Corn	Remaining Cover Factor Soybeans
After Harvest	.90-.95	.80-.90
Over Winter Decomposition	.80-.90	.70-.80
Plow	.02-.07	.00-.02
Chisel (Twisted Shank)	.40-.50	.10-.20
Disk (Off-set, Deep)	.25-.40	.10-.20
Para Plow	.65-.75	.35-.45
Chisel (Straight Shanks)	.50-.60	.30-.40
Disk (Tandem, Shallow)	.65-.75	.25-.35
Anhydrous Applicator	.75-.85	.45-.55
Field Cultivator	.80-.90	.55-.65
Plant	.80-.90	.80-.90*
Till-plant	.55-.65	.55-.65*

**When these are the only operations where soil is disturbed, multiply by .75.*

Example: A corn crop after harvest leaves 95% residue. Only 90% of that is left after winter. There is an anhydrous application; disking (shallow and tandem); and planting. The calculations are .95 x .80 x .70 x .90 = .43, or a residue percentage of 43 after planting.

Residue Cover Prediction

After Harvest %		After Winter %		1st Tillage		2nd Tillage		% Residue Left
______	x	________	x	_______	x	________	=	______

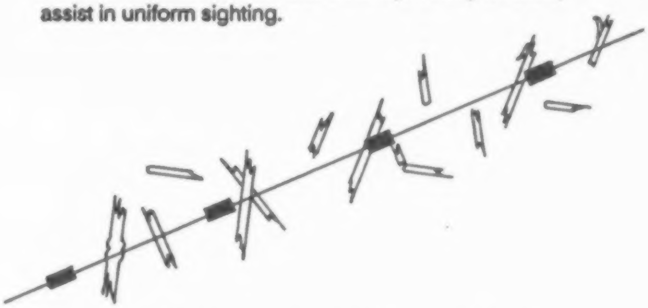
Measuring Residue Cover

Percent ground cover should always be measured as soon after planting as possible. The accuracy of ground cover measurement decreases as the length of time after planting increases.

1. Use any line that is equally divided into 100 parts. Fifty foot cable transect lines are available for this purpose. Another tool is a nylon rope with 100 knots, six inches apart.

2. Stretch the line diagonally across the rows.

3. Count the number of marks (tabs or knots) that have residue under them when sighting from directly above one end of the mark. It is important that the same point on each mark be used to insure accuracy. A flag wire may assist in uniform sighting.



Residue is counted only if it falls under the left side of the mark. The count would be as follows starting at the left and moving to the right: no/no/yes/yes

4. Walk the entire length of the rope or wire. The total number of marks with residue under them is the percent cover for the field, i.e., if 20 knots are counted, the percent residue cover in that area is 20 percent.

5. Repeat this procedure at least three times in different areas of the field, and average the findings for your representative measurement of the field.

SUPERVISED AGRICULTURAL EXPERIENCES

A. Ag. Skills

3. **WHAT** - Research and Crop Production Skills (Erosion/Productivity Connection)

WHO - Individuals interested in (1) collecting data for study or research and (2) those interested in a system's approach in farming highly erodible land.

WHY - To develop an appreciation for using science in research as well as a systems approach in establishing and managing crops.

WHERE - In conjunction with the Soil Erosion/Productivity Study and/or teaching the importance of developing individual skills, which contribute to a management system.

(Skill description applies to establishing the Erosion Productivity Study, however much of the skills will apply to a systems approach in managing crops.

#1 - Locate Study Plot

A. Use soil survey maps to locate soils to be included in the study (Instructions on how to use the report are included).

B. Use a county map to identify plot location.

C. Plots should be selected using the following criteria:

- Select plots by landscape position on summits and side-slope positions (See Diagram #1)
- Minimum plot size should be 50' x 50'.
- Select a minimum of two erosion phases (Phase 1, 2 or 3) within the field and at least one erosion phase 3 plot in the county.

- Get at least one plot on each soil map unit of a soil series having different degrees of erosion and slope classes, if you are planning to evaluate in a model. (Example 9B, 9B2, 9C, 9C2, 9D3, 9E, 9E2, and 9E3).

- For convenience, fields should be located within 500' of the edge of the field.

- Management should be the same for all plots in a field. (Plots on the same rows in the field is one way to get the same variety of corn).

- Avoid locating plots where soil has been disturbed, on old building sites, feedlots, or where manure was added in the past 2 years or in fields that will be cut for silage.

D. You need to get final permission to use the field for study from the farmer.

E. Arrange for having a rainguage near the plot and for keeping rainfall records.

DIAGRAM #1.. EROSION-PRODUCTIVITY STUDY

Identification No. 2-1-1 to 4-83

Cooperator Jeff Crill

EXAMPLE

All plots should be located on this part of the landscape.

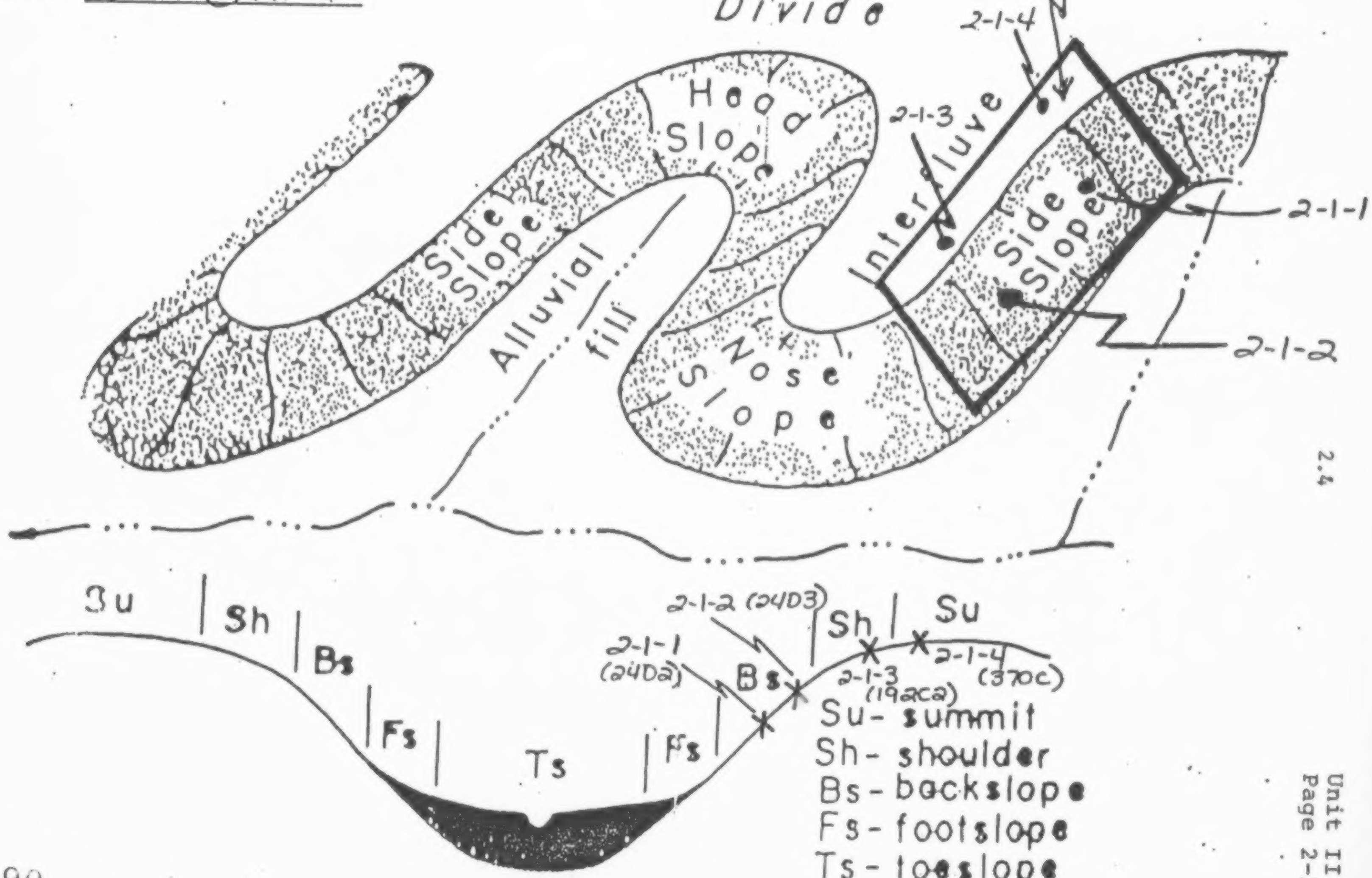

Divide
2-1-4
2-1-3
Head Slope
Interfluve
Side Slope
Side Slope
2-1-1
2-1-2
Alluvial fill
Nose Slope
Su
Sh
Bs
Fs
Ts
Fs
Bs
Sh
Su
2-1-2 (24D3)
2-1-1 (24D2)
2-1-3 (192C2)
2-1-4 (370C)
Su - summit
Sh - shoulder
Bs - backslope
Fs - footslope
Ts - toeslope

Diagram #1

2.4

#2 - Records Management (Eight skills are described within this records management system)

A. Keep a record of each plot on a county map, on an ASCS aerial photo, and on a sketch with large enough scale to show where plots are located in each field and the plot numbers that you'll use (Example - Plot #1)

B. Record Farmer's name and address

C. List primary tillage (used in the past and to be used).

Examples:

1. Moldboard plow (Fall - Spring)

2. Chisel or disk (Fall - Spring)

3. Deep tillage (over 6" deep)

4. Shallow tillage (0 to 6" deep)

D. List seed bed preparation information (Used in the past and to be used)

1. Disk: _____ single _____ tandem

2. _____ Harrow

3. _____ Field Cultivator

4. _____ other list

5. _____ Total number of primary operations

E. List planting, cultivation and growth information:

1. Date of planting _____________

2. Variety and number ___________

3. Variety maturity: _____ early, _____ medium,

_____ late

4. Hybrid cross (_____ 4x, _____ 3x, and _____ other)

5. Planting rate (No. kernels/acre) ________

6. Planter row spacing (inches) ____________

7. Approximate number of days for emergence of crop ________.

8. Cause of delayed emergence, uneven stand?

9. Number of times harrowed after planting or emergence:

   _____ Rotary Hoe

   _____ Cultivated

   _____ Total number of operations

F. List Information on Pesticide Application

1. Treatment for soil insects

   Date ____

   Method of application _______________________

   Chemical used _______________________________

   Rate per acre _______________________________

2. Treatment for corn borer control

   Date ____

   Growth stage ________________________________

   Method of control ___________________________

   Chemical used _______________________________

   Rate ____

3. Treatment for weed control

Date ______________________________

Chemical used ______________________________

Rate of application ______________________________
(active ingredients)

G. Fertility Management

1. Fertilizers applied (not to include row fertilization)

Fall ______________________________

Pre-plant Spring ______________________________

Type: side dressed - dated growth __________

Method:

Broad cast - plowed under ______________________

Broad cast - disked in ______________________

Broad cast - on surface ______________________

Banded ______________________________

Rate: per acre and grade ______________________

Nutrients applied (pounds/acre)

N ________, P_2 O_5 ________, K_2 ________

2. Row fertilizer and planting

Rate per acre and grade ______________________

Nutrients (pounds/acre)

N ________, P_2 O_5 ________, K_2 ________

3. Limestone

Date applied ______________________________

Effective CaCo equivalent (ECCE)

Rate:

Tons/acre of material ______________________

Tons/acre ECCE ______________________________

H. Crop Damage Report (Hail, Disease, and Frost)

1. Hail damage: Estimated % yield loss ________

   How estimated ______________________________

2. Disease damage: Kind ______________________

   Estimated yield loss _______________________

   How estimated ______________________________

3. Frost damage (before maturity)

   Date of frost ______________________________

   What damaged (killed plants) _______________

   Upper leaves only __________________________

   Etc. _______________________________________

   Estimated % yield loss _____________________

   How estimated ______________________________

I. Cropping and Conservation History (The following for as many years as available)

1. Year ________ Crop ________

   Estimated yield ___________

2. Methods of harvest (pasture, silage, grain)

3. Fertilizers (pounds/acre and grade) _________

4. Manure (pounds/acre of N_g P_2O_5, K_2O estimated

   ____

5. Lime (tons/acre of ECCE) ___________________

6. Number of years (list the following by year):

Contour plowed ______________________________

Planted on contour __________________________

Used conservation tillage (specify type) and list the average 10 residue cover left after planting. ________________________________

____

____

7. List row direction in the current year ______

- Number of years the field was planted in this direction ________________________
- Specify years and row direction if field was planted in another direction __________

____

J. Maintain rainfall records (See attached instructions and record format).

4.1

RAINFALL RECORDS
Erosion-Productivity Study (EPS)

Since rainfall is one of the most important variables in corn production and has direct effects and interactions with soil type, management, and conservation practices on corn yields, rain gauges are located within ½ to 1 mile of the fields selected for study.

The rain gauge furnished should be placed on a fence post in an open area. The gauge should be attached to the post so that the opening is as level as possible. This is very important for getting accurate rainfall readings.

The rain gauge should be read once each day, preferably in the morning from 6:00 to 8:00 a.m., and the records kept on the forms provided. If during the 24-hour period when the rainfall is collecting in the gauge a very heavy rain occurs in a short time, then the amount and length of time it rained should be shown in the Remarks column for that date. If you are away from home and cannot get anyone to take the readings, please make an estimate and put a circle around the reading. A note in the Remarks column would be helpful about the estimate as to the days the readings were not recorded, etc.

The rain gauge should be in place April 1 and taken down October 1. During early April, care should be taken to keep water from freezing in the gauge.

If a leak develops in the seams of the gauge, they can be cemented with fingernail polish applied to the outside edges. If the leak cannot be stopped, notify the District Conservationist at the SCS field office and the gauge will be replaced.

A copy of the rainfall readings for each month should be returned to the SCS field office sometime in October.

RAINFALL RECORDS
Erosion-Productivity Study (EPS)

NAME ______________________ COUNTY ________________ YEAR ____

Date	Month ____	Remarks
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		

Date	Month ____	Remarks
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
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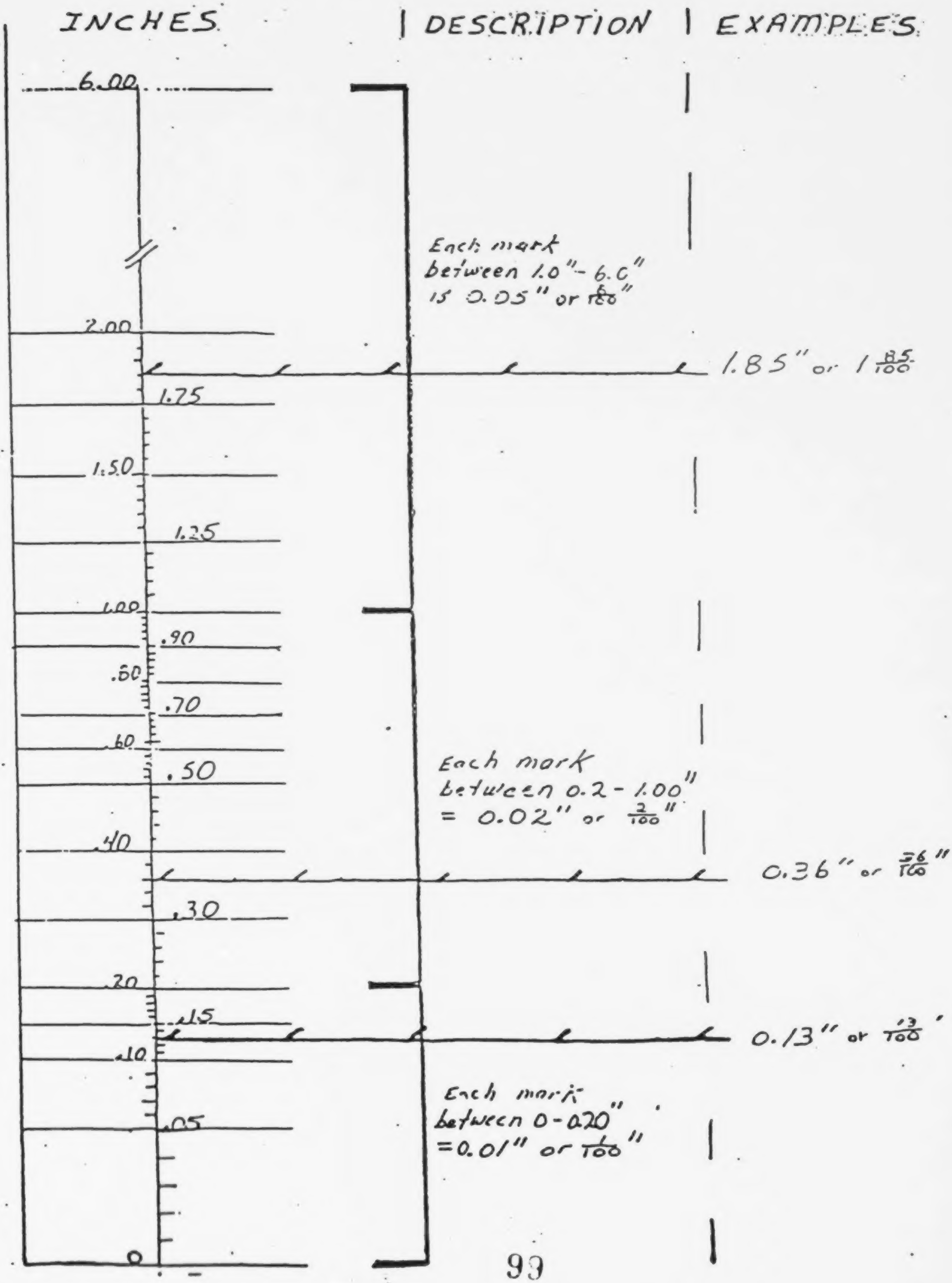
26		
27		
28		
29		
30		
31		

4.f

Reading the Rain Gauge


INCHES
DESCRIPTION
EXAMPLES
6.00
2.00
1.75
1.50
1.25
1.00
.90
.80
.70
.60
.50
.40
.30
.20
.15
.10
.05
0

Each mark between 1.0"-6.0" is 0.05" or $\frac{5}{100}$"

Each mark between 0.2-1.00" = 0.02" or $\frac{2}{100}$"

Each mark between 0-0.20" = 0.01" or $\frac{1}{100}$"

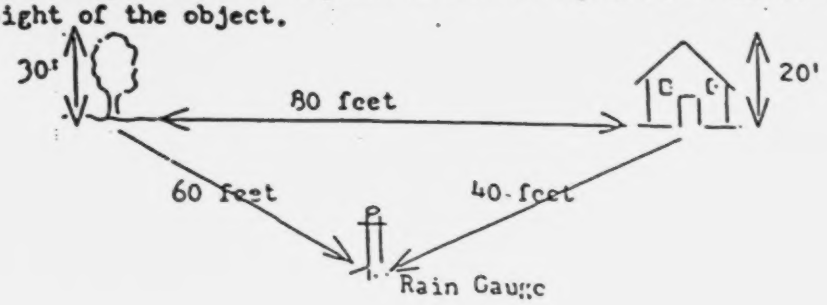
1.85" or 1 $\frac{85}{100}$

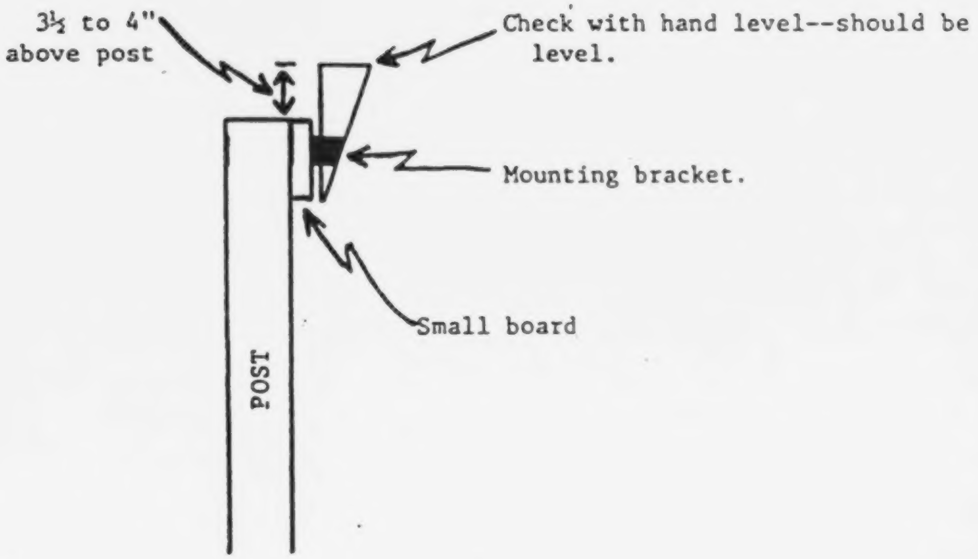
0.36" or $\frac{36}{100}$"

0.13" or $\frac{13}{100}$"

MOUNTING THE RAIN GAUGE

1. The rain gauge should be mounted away from buildings and trees. Distances away from tall objects should be equal to at least 2 times the height of the object.


30'
80 feet
20'
60 feet
40 feet
Rain Gauge


3½ to 4" above post
Check with hand level--should be level.
Mounting bracket.
Small board
POST

#3 - Silking and Stalk Counts and Leaf Sampling

1. Making silking counts at the time when 75% of the silks have emerged is the key index to the maturity development of corn. This index is used in the weather program to compute the moisture stress index. The 75% silking date is also used to estimate maturity if needed to estimate yield loss due to a freeze or stalk rot damage. Thus, the 75% silking date needs to be determined accurately.

2. The leaves sampled at the silking time are analzyed chemically to determine the nutrient status of the corn (N, P and K). The nutrient concentration in the leaves reflect the nutrient availability in the soil prior to silking (for the environmental conditions encountered). If a yield difference occurs between erosion or slope classes, the leaf analysis may explain why it occurred if it was nutrient related. The chemical analysis of mature corn grain is useful to determine primarily the N status of the corn.

   Take the following notes at silking:

   A. Determine when 75% silking has occurred (record only the number of stalks on which the silks of the primary (top) ear shoot have emerged at least 1/2").

   B. Calculate the percent stalks silked (record date and time of day each plot was checked until 75% silked. Under very favorable conditions, rate of silking will be from 30% per day in single-cross hybrids to 20% per day in 4-way crosses).

   C. Count and record the number of stalks in the two outside rows showing first-brood cornborer leaf or stalk feeding. (Calculate % of stalks with damage).

   D. Record extent of root and stalk lodging in the 2 outside rows, count and record % of each of the following: (1) root-lodge stalks (learning from roots more than 30 degrees from vertical and (2) stalk-lodge stocks (broken above ground level).

E. Record notes on presence or absence of moisture stress in the corn, wilting, rolling of leaves, white-top (caused by associated high temperatures) and stunted growth in the top half of the plant show severe stress. Slow rate of ear development and silk emergence indicates moisture stress although nutrient deficiency may retard both too.

F. Record notes on any nutrient deficiencies. Nitrogen deficiency symptoms may develop between first silks and 75% silking. Potassium deficiency symptoms will be apparent at tasseling. Phosphorus deficiency is difficult to see.

G. Take leaf samples from silked and unsilked plants at the same % as the silking rate, remove the first leaf opposite and below the main (top ear shoot). Remove leave at the collar (junction of the leaf blade and leaf sheath tissue). Number of leaves should vary with the stand level, 12,000 - 16,000 stalks per acre - 14 leaves, 16,000 - 20,000 stalks per acre - 16 leaves, 20,000 - 24,000 stalks per acre - 18 leaves, above 24,000 - 20 leaves. (Dry leaves to prevent spoilage).

H. Take root samples

Dig up a random sampling (4 root systems) from unlodged, moderately lodged and severely lodged stalks (7" cube around base of stalk) carefully remove most soil to minimize damage to the root system and place in sack. An entomologist will need to rate the damage.

I. Describe weed competition.

Sampling Final Stand Count, Corn Harvest, Lodging, Borer Damage and Calculating Yields

For ease of operation, the corn in the plots should be harvested when the grain moisture is less than 30%. If the farmer plans to cut the plot area for silage, the plots will have to be harvested earlier and at higher moisture.

1. Measure, mark and record area for weed sample and cut, sack, and identify weeds from sample area (2 to 3' wide across 4 harvest rows).
2. Count and record root and stalk lodging.
3. Count and record total stalks and barren stalks.
4. Pick, count ears (including nubbins), and sack corn from harvest area.
5. Count and record corn borer cavities in stalk.
6. Take soil sample from area.
7. Weight corn and *shell corn for moisture sample.
8. Complete management questionnaire.

See attached field data record sheet.

*For the moisture sample, randomly select 1/3 to 1/2 of the ears and shell into a bucket (2 rows of kernels from each ear) with a screwdriver. Put 1 pint of shelled corn into a moisture-proof bag (take to grain elevator for moisture determinations).

FIELD DATA
Erosion-Productivity Study

County ____________________ Ident. No. ________________ Year ___________

Date harvested ____________ Data collected by ____________________________

A. Site area

1. Field contoured: Yes _____ No _____
2. Rows thru harvest area: Slope (%) ___________ Direction ___________
3. Site: Slope (%) _________ Aspect (direction) of slope ___________
4. Field terraced: Yes _____ No _____
5. Distances to terraces:
    Above site (if less than 200') ___________
    Below site (if less than 100') ___________

B. Corn yield

1. Area harvested (width of 4 rows x length) ________________________
2. Fraction of an acre (calculate later) ____________________________
3. Calculation of corn yield
    a. Weight of corn (pounds, tared) (record each weighing on left margin) ______________________________________
    b. Moisture % of corn grain at harvest (determine later) ________
    c. Weight of ear corn at above moisture to give 56 pounds of shelled corn at 15.5% moisture (from table) ______________
    d. Corn yield (bushels per acre) ___________________________
4. Alternative method of calculating corn yield (for low-quality corn)
    a. Weight of harvested corn (pounds) (record each weighing) _____
    b. Weight of ear corn sample before drying (pounds) ___________
    c. Weight of ear corn sample after drying (pounds) ____________
    d. Weight of shelled corn (pounds) __________________________
    e. % moisture of shelled corn ______________________________
    f. % moisture of grain at harvest (calculate later) ___________
    g. Corn yield (bushels per acre) ___________________________

C. Stand level

1. Total stalks from harvested area (do not count suckers) __________
2. Total ears ____
3. Total barren stalks (do not count suckers) _____________________
4. Total double ears (2nd ears on main stalks and ears on suckers) ___
5. Total stalks per acre (calculated later) _______________________

Revised by: Lloyd Dumenil, April 1984.

2. Field Data (continued)

D. Root lodging

	Number of stalks	%
1. Leaning between 30° and 60° from vertical	______	______
2. Leaning more than 60° from vertical	______	______

E. Stalk lodging

	Number of stalks	%
1. Broken below ear	______	______
2. Broken above ear	______	______

3. Cause of stalk lodging: Corn borer ______
   Other (specify, if possible) ______

F. Weed infestation

1. Area sampled (4 rows wide x 2 to 3 feet) ______
2. Fraction of an acre (calculate later) ______
3. Air-dry weight of weeds (pounds or ounces)

	Grassy weeds	Broadleaf weeds
a. From sampled area	______	______
b. Per acre (calculate later)	______	______

4. Dominant weeds (important) ______

G. Corn borer infestation

1. Number of stalks counted ______
2. Average number of cavities per stalk
   a. Old cavities in stalk (1st brood) ______
   b. Recent cavities in stalks and ear shank (2nd brood) ______
3. Any other comments on corn borer infestation ______
   ______

H. Check list

Before leaving field

1. Contouring checked ______
2. Row slope and direction ______
3. Site slope and aspect ______
4. Terrace distances ______
5. Barrens and doubles ______
6. Ears counted ______
7. Stalks counted ______
8. Root and stalk lodging ______
9. Weed area recorded ______
10. Weeds cut and sacks labeled ______
11. Borer counts recorded ______
12. Soil sample taken and labeled______
13. Root sample taken and sack labeled ______
14. All equipment and samples accounted for ______

Before leaving farm

1. Corn weights recorded ______
2. Grain moisture taken ______
3. Moisture sample tag labeled and inside of bag ______
4. Corn disposed of ______
5. Mgmt. Questionnaire picked up and completed ______
6. Items on harvest check list completed ______

CALCULATING CORN YIELDS

Usual method for good quality corn:

Plot Dimensions - (50 x 50') = $\frac{43,560}{2500 \text{ sq. ft.}}$ = Area of plot factor (17.4)

Area of Plot Factor $\frac{17.4 \times \text{lbs. of ear corn from plot}}{\text{*grain moisture factor}}$ = Yield of No. 2 corn 15.5% moisture

*Grain moisture factor given in attached table.

Calculating Corn Yields

Erosion-Productivity Study

1. Usual method for good quality corn at a grain moisture less than about 35%:

$$\text{Yield (bu/acre of No. 2 or 15.5\% moisture corn)} = \frac{\text{area factor x lb. of ear corn from plot}}{\text{grain moisture factor}}$$

$$\text{Area factor} = \frac{43560}{\text{area of plot in sq. ft.(length x width)}}$$

Grain moisture factor = factor given in Table 1 for the moisture of the grain taken from the ears at harvest.

2. Alternative method for high moisture corn (above about 35% grain moisture):

From total weight of corn from plot, weigh and sack a 10-15 pound subsample of the ears, dry to 15-20% grain moisture, weigh dried corn, shell 2 rows from the ears with a screwdriver, and determine moisture content of shelled corn.

$$\text{Yield (bu/acre of No. 2 corn)} = \frac{A \times B \times C}{D}$$, where

A = area factor (see above),

$$B = \text{subsample factor} = \frac{\text{total lb. of ear corn from plot}}{\text{lb. of corn in subsample \underline{before} drying}}$$,

C = lb. of ear corn in subsample after drying, and

D = grain moisture factor from Table 1 based on percent moisture of grain from dried subsample.

3. Alternative method for low quality corn (below-average shelling percentage):

Weigh total amount of corn from plot, weigh and sack a 10-15 pound subsample of the ears, dry to about 15% grain moisture, weigh dried ear corn, shell all of grain from all ears, weigh shelled corn, and determine moisture of shelled corn,

$$\text{Yield (bu/acre of No. 2 corn)} = \frac{A \times B \times C \times D}{47.32}$$, where

Calculating corn yields (con't)

A = area factor (see section 1),

B = subsample factor (see section 2),

C = lb. of shelled grain in subsample after drying,

D = dry matter fraction in shelled corn = $1.00 - \frac{\%\ \text{moisture}}{100}$,

47.32 = lb. dry matter in 1 bushel of No. 2 (15.5% moisture) shelled corn -- calculated as 56 x 0.845.

Table 1. Grain moisture factors to convert ear corn at various grain moisture levels to bushels of shelled corn at 15.5% grain moisture.

Percent H_2O	Pounds of ear corn required to yield 56 lbs. (1 bu.) of shelled corn at 15.5% moisture									
	Tenths									
	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
10	63.49	63.56	63.64	63.71	63.79	63.86	63.94	64.01	64.09	64.17
11	64.25	64.33	64.41	64.49	64.57	64.65	64.73	64.81	64.90	65.00
12	65.06	65.15	65.24	65.32	65.41	65.50	56.59	65.68	65.77	65.86
13	65.95	66.04	66.14	66.23	66.32	66.42	66.51	66.61	66.70	66.80
14	66.89	66.99	67.09	67.18	67.28	67.38	67.48	67.58	67.69	67.79
15	67.89	67.99	68.09	68.20	68.30	68.40	68.50	68.62	68.72	68.83
16	68.94	69.05	69.17	69.28	69.40	69.51	69.63	69.74	69.86	69.97
17	70.09	70.21	70.33	70.45	70.57	70.69	70.81	70.94	71.06	71.19
18	71.31	71.44	71.57	71.69	71.82	71.95	72.08	72.21	72.34	72.47
19	72.60	72.73	72.87	73.00	73.14	73.27	73.41	73.55	73.68	73.82
20	73.96	74.09	74.22	74.34	74.47	74.60	74.75	74.90	75.06	75.21
21	75.36	75.50	75.64	75.79	75.93	76.07	76.21	76.36	76.50	76.65
22	76.79	76.94	77.09	77.23	77.38	77.53	77.67	77.82	77.96	78.11
23	78.25	78.40	78.55	78.71	78.86	79.01	79.16	79.31	79.46	79.61
24	79.76	79.91	80.06	80.20	80.35	80.50	80.65	80.80	80.95	81.10
25	81.25	81.41	81.56	81.72	81.87	82.03	82.19	82.35	82.50	82.66
26	82.82	82.96	83.09	83.23	83.36	83.50	83.64	83.78	83.91	84.05
27	84.19	84.33	84.47	84.62	84.76	84.90	85.04	85.19	85.33	85.48
28	85.62	85.76	85.90	86.04	86.18	86.32	86.46	86.61	86.75	86.90
29	87.04	87.18	87.33	87.47	87.62	87.76	87.90	88.06	88.20	88.35
30	88.50	88.64	88.79	88.93	89.08	89.22	89.36	89.51	89.65	89.80
31	89.94	90.09	90.23	90.38	90.52	90.67	90.82	90.97	91.13	91.28
32	91.43	91.57	91.71	91.85	91.99	92.13	92.27	92.42	92.56	92.71
33	92.85	92.99	93.13	93.27	93.41	93.55	93.70	93.84	93.99	94.13
34	94.28	94.42	94.56	94.70	94.84	94.98	95.13	95.27	95.42	95.56
35	95.71	95.85	96.00	96.14	96.29	96.43	96.58	96.73	96.87	97.02
36	97.17	97.32	97.46	97.61	97.75	97.90	98.05	98.20	98.34	98.49
37	98.64	98.79	98.94	99.08	99.23	99.38	99.53	99.68	99.83	99.98
38	100.13	100.28	100.43	100.58	100.73	100.87	101.03	101.18	101.33	101.48
39	101.63	101.78	101.93	102.09	102.24	102.39	102.54	102.70	102.85	103.01
40	103.16	103.31	103.46	103.62	103.77	103.92	104.07	104.22	104.38	104.53
41	104.68	104.83	104.99	105.14	105.30	105.45	105.60	105.76	105.91	106.07
42	106.22	106.37	106.53	106.68	106.84	106.99	107.14	107.30	107.45	107.61
43	107.76	107.91	108.07	108.22	108.38	108.53	108.69	108.84	109.00	109.15
44	109.31	109.47	109.62	109.78	109.39	110.09	110.25	110.41	110.56	110.72
45	110.88	111.04	111.20	111.36	111.52	111.68	111.84	112.00	112.16	112.32

SUPERVISED AGRICULTURAL EXPERIENCES

B. Improvement Projects

1. **WHAT** - Assist in conducting a Food Security Act Planning Meeting.

   WHO - Individuals, group of students or chapter (Could be a part of a BOAC Project).

   WHY - Students can take the leadership in insuring that farmers develop a conservation plan to remain eligible for the Food Security Act.

   WHERE - A meeting location to be arranged by students.

   WHEN - In sufficient time to allow farmers to have a conservation plan developed before January 1, 1990.

   HOW -

   a. Following the teaching of The Conservation Provisions of the Food Security Act and The Developing of Conservation Planning Skills for the Food Security Act of 1985 (Instructional plans included in this handbook). Plan the program - Presentations, worksheets, visual aids, time, invitations, publicity, etc. on the topic of "Developing a Conservation Plan for My Farm" (Could give individual students responsibility for individual phases). Use the video "Your Conservation Plan" on the Soil Conservation Tape.

   b. Evaluate, based on whether farmers attending, do get involved in developing their conservation plan to remain eligible for USDA benefits.

SUPERVISED AGRICULTURAL EXPERIENCE

B. Improvement Projects

2. **WHAT** - Assist in applying Conservation Systems to at least one or more highly erodible fields.

WHO - Individual Student

WHY - To remain eligible for the Food Security Act (The student may be responsible for or assist parents in applying necessary conservation systems by January 1, 1995).

WHERE - On the student's home farm, a public farm or a prearranged crop field or fields.

WHEN - In sufficient time to allow a conservation plan to be developed by January 1, 1990, and applied to the field or fields by January 1, 1995.

HOW -

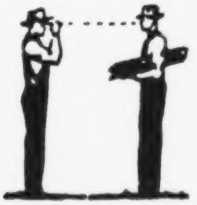
a. Following the teaching of The Conservation Provisions of the Food Security Act, The Developing of Conservation Planning Skills for the Food Security Act of 1985 (Instructional plans included in this handbook) and the development of a conservation plan on the selected field or fields, develop a plan of action on how one or more conservation systems will be applied as follows (job sheets follow):

- Lay out contour lines or contour strip cropping strips.
- Seed grass headlands (field boarders) on sloping portions of the fields.
- Assist SCS in laying out terraces if needed.
- Seed terraces if grass backslope or narrow based terraces are installed.
- Plant crops in terraced fields.
- Seed, fertilizer and mow grass waterways if needed.
- Measure crop residue and limit tillage operations which will result in needed residue cover following planting.
- Plant or carry out seeding based on needed crop rotation.
- Make a critical area planting on a severly eroding slope or a slope subject to severe erosion like the backslope of a grassed blackslope terrace or a dam.

- Mulch a critical erosive slope as part of a critical area planting skill.
- Plan and farm a contour strip cropping field.
- Develop an area for wildlife.
- Drain a hillside seep on cropland.

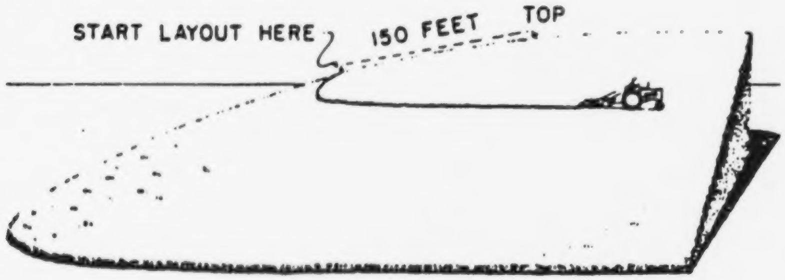
b. Evaluation - have applied conservation systems resulted in the needed reduced soil losses to qualify for the Food Security Act?

CONTOURING



First stand on land level with helper and use hand level to determine which part of his hat, face or shoulder is level with your eyes. This is your "target."

1. Set the first stake at any point in the proposed contour line. Take position with hand level at this stake.
2. Helper walks in direction of line about 100 feet (25 feet on curves), and faces you. Signal helper to move up or down hill until hand level shows he is on the contour. Helper now drives stake.
3. Move up to the new stake while helper walks farther along the line. Repeat this process until the line is staked out.
4. As contour line is established, mark it with a plow.

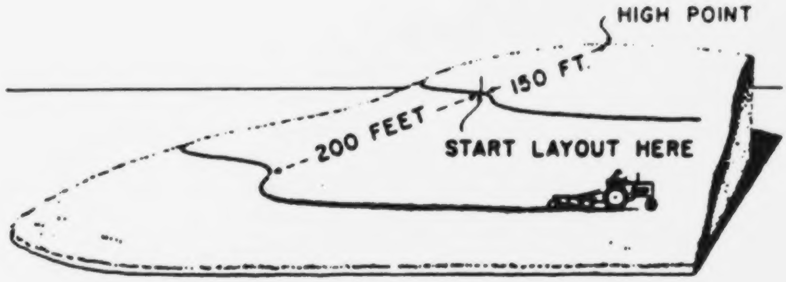


Regular Slope

If your field has about the same slope all along the proposed contour line and is not over 300 feet from top to bottom, use one contour line 1/3 of the way down. If the slope is longer than 300 feet, locate the line 150 feet from the top and use an additional line every 200 feet below.

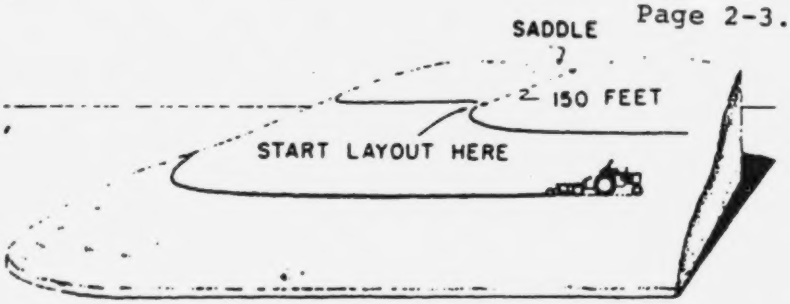
Irregular Slope

If your field has steeper places along the proposed contour line, walk to the steepest place and start the first line about 1/3 of the way down (or 150 feet down if the slope is longer than 300 feet). Use an additional line about each 200 feet below if the slope is long enough.

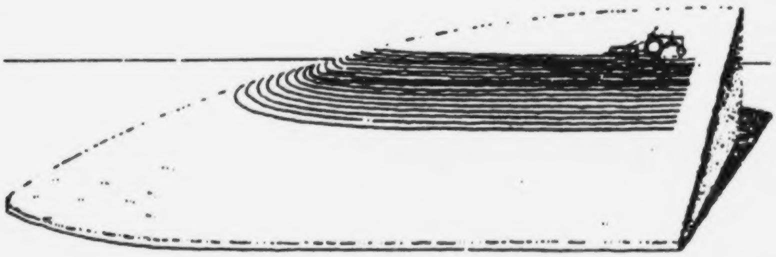


Saddle

If there is a saddle in the ridge top, start your first contour line about 150 feet below the "seat" of the saddle. Other lines may be needed above for high point areas.



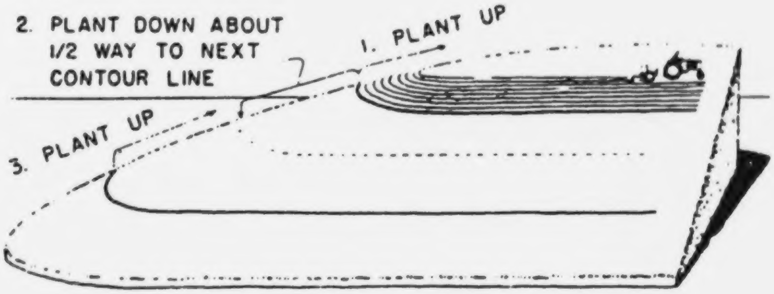
Plowing



Start plowing your contoured field by backfurrowing on the contour lines. Continue backfurrowing until the plowed strips are about 100 feet wide or until end travel is excessive. Now plow around the unplowed land between the contour lines. When the unplowed land is just wide enough to turn on, start turning back by cutting across at the narrow point. Keep turning back until the entire land is brought to turn-strip width. Then finish by plowing around it. Don't plow across grass waterways. Leave sod turn rows; otherwise plowing and planting up and down hill will cause erosion.

Planting

Start at the top contour line and plant up hill until the slope above is planted. Next start at the lower side of the same contour line and plant about half-way to the line below, at the narrowest point. Now start at the second contour line and plant up hill until you reach the rows at the narrow point. Finish by planting the short rows. Another way to do this is the turn-strip method suggested for plowing. The turn rows, usually 8, are planted first except for hard ground listing.



Cultivating

Follow the planter pattern. Cultivate the long rows first.

Field Border Strips

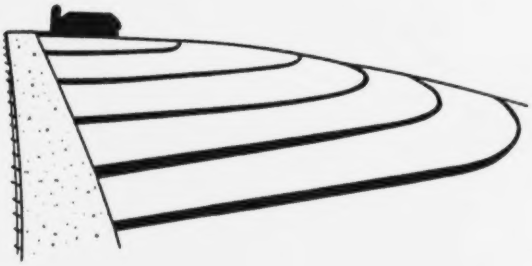
A field border strip is a band of grasses or grasses and legumes established next to croplands or woodlands. Sometimes called "picture frames," these strips provide three significant features: 1) Erosion control at edge of croplands 2) Turn row for farming equipment and 3) Nesting cover and general wildlife habitat diversity.

Where they can be used

1. Sloping ends of crop fields. They serve as turn areas, and replace end rows that would run up-and-down hill and cause soil erosion.

2. Along cropland areas adjacent to woodlands. These less productive areas can make excellent diversity of habitat for wildlife if seeded to grass and legumes.

3. Next to crop fields along drainage ditches, streams, steep draws or gullies.



Field border strips are used as a turn area on contoured fields.

Establishment Recommendations

Select appropriate grasses or legumes as determined by soil conditions. Consider brome-alfalfa or native grasses for maximum wildlife benefits.

Species	lbs/acre (P.L.S.)

Fertilizer Recommendations ____________

____

____

Maintenance

1. Protect from livestock to maximize wildlife benefits.

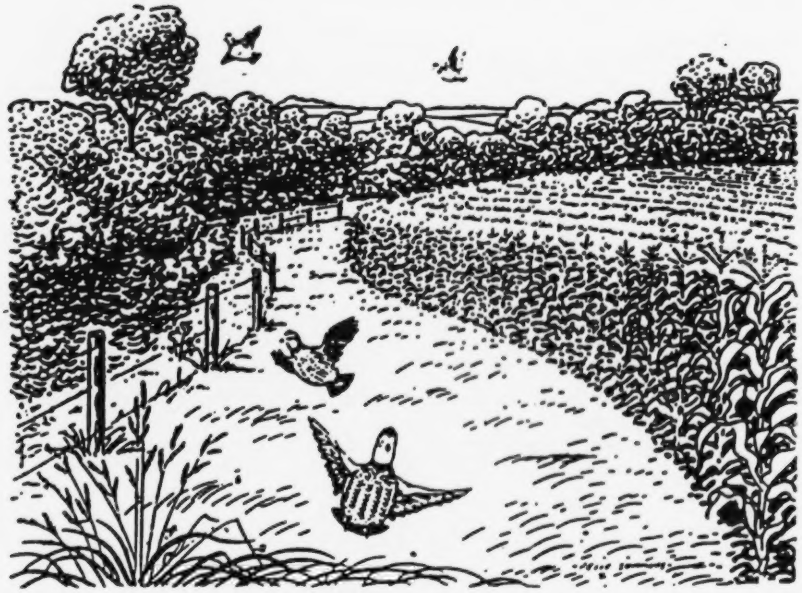
2. Mow to control weeds or shrub development. Delay mowing until July 15 to avoid nesting birds.

3. Consider top-dressing with fertilizer, or reseeding if necessary.

4. On adjacent sloping cropland, till soil on the contour, at right angles to the field border. This prevents water from forming gullies along to the field borders.

5. Shut off farm chemical sprayers when turning on a field border, and insist custom chemical applicators

FIELD BORDER STRIPS



FIELD BORDER STRIP

A field border strip is a band of grasses or grasses and legumes of variable widths established next to croplands or woodlands. These strips provide three significant features: 1. erosion control of sediment leaving croplands 2. turn row for farming equipment 3. Nesting cover and general wildlife habitat diversity.

Where they can be used

1. The sloping ends of cropfields to replace end row that would otherwise run up-and-down hill.
2. Along cropland areas adjacent to woodlands that are the most unproductive due to shading or moisture competition.
3. Between croplands and drainage ditches, streams, steep draws or gullies.
4. In access roads, along pipe lines or power lines, especially through woodlands.

Establishment Recommendations

Select appropriate grasses or legumes as determined by soil conditions. Consider orchard grass, bluegrass, or bromegrass for shade areas. Excellent wildlife benefits can be realized with brome, brome-alfalfa or native grasses.

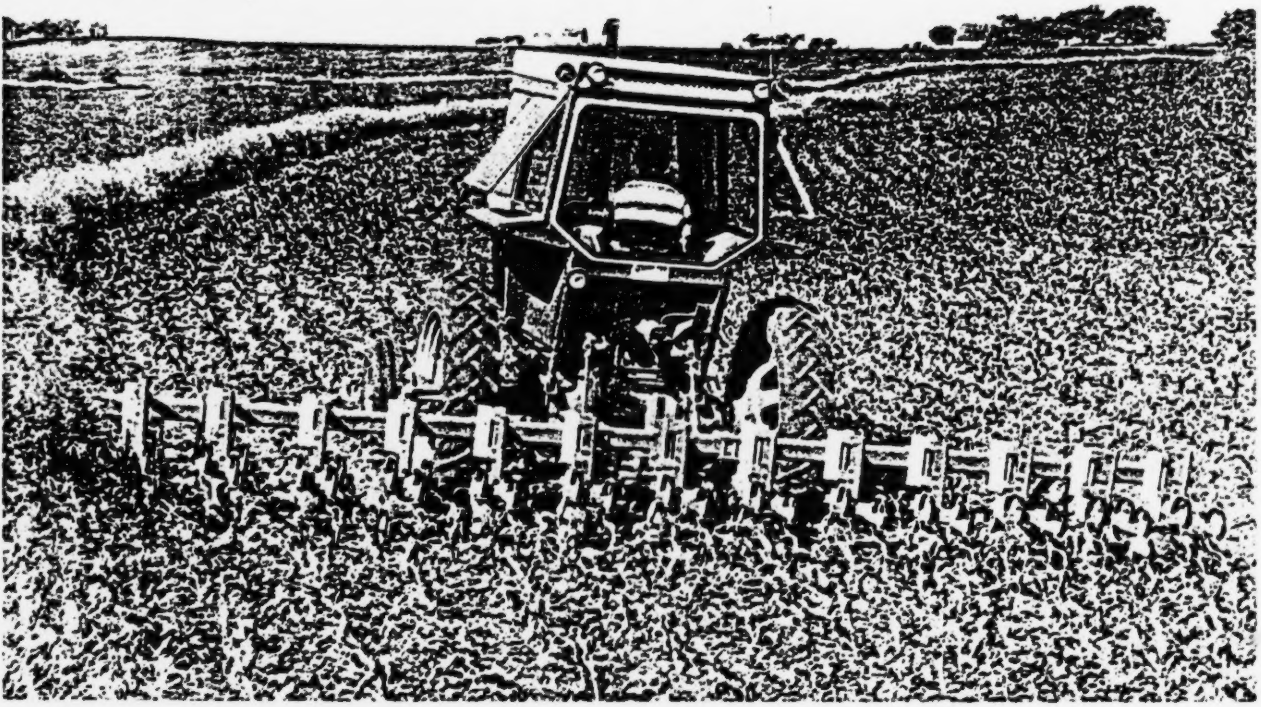
Species	lbs/acre (P.L.S.)
______________________________	___________
______________________________	___________
______________________________	___________

Fertilizer Recommendations ____

Maintenance

1. Check periodically to avoid major problems.
2. Protect from livestock to maximize benefits.
3. Mow after July 15th to control weeds or shrub development.
4. Do not burn unless possibly required for management of the plant (native grasses).
5. Consider top-dressing with fertilizer or reseeding if necessary.
6. Where adjacent to sloping cropland, till soil at right angles to field border to prevent water from forming new channels or gullies adjacent to the field border.
7. Shut off farm chemical sprayers when turning on field border and insist custom chemical applicators do the same.

Cropland Terraces in Iowa



The primary purpose of a terrace system is to reduce sheet erosion on cropland fields. Terraces reduce the rate of runoff to reduce soil erosion, and keep most eroded soil in the field. Terraces are often used to store runoff water temporarily, and may eliminate the need for grassed waterways. They can often be laid out parallel to one another for farming efficiency.

Terracing does not give complete control of sheet and rill erosion, and is best used in combination with other soil conservation practices. Terraces work well with conservation tillage, crop rotations, and grass field borders.

Terracing reduces sediment pollution of lakes and streams, and the grass backslopes of some types provide cover for wildlife.

United States Department of Agriculture

Soil Conservation Service

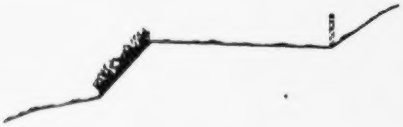
Terrace Types

There are three basic terrace types—grassed backslope, broadbase, and narrowbase. Each type can accommodate modern farm machinery; terrace spacings are usually in multiples of eight or twelve rows.

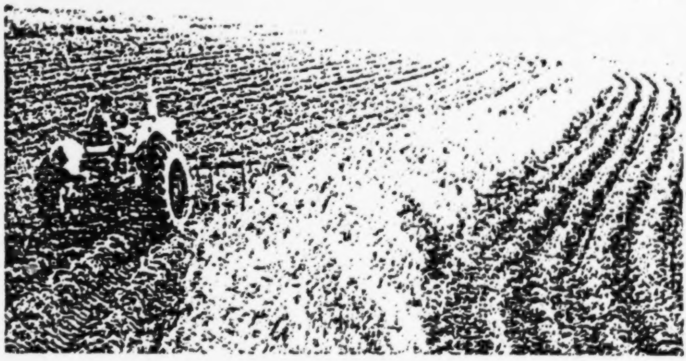
Stockpiling of topsoil is recommended for most soils. Topsoiling helps prevent yield reduction in the terraced area, since topsoil is temporarily piled and then spread over the area as a last step in construction.

On all but very permeable loess and sandy soils, tile outlets or gras ed waterways are necessary to pre vent crop losses from crops drown ing out.

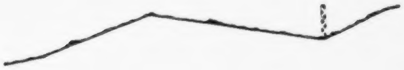
Grassed Backslope



This terrace has a steep backslope which isn't farmed. To build the terrace, soil is usually pushed up from the downhill side, resulting in a flatter farmable area. The grassed backslope terrace is best on slopes over 6 percent, and is less expensive than the broadbase terrace.

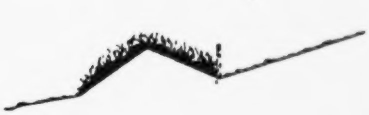


Broadbase



The entire terrace can be farmed, but this terrace is not recommended for steeper slopes. To build this terrace, soil may be pushed from either uphill or downhill. This terrace may result in a steeper farmable area.

Narrow Base



Both sides of this terrace are steep and seeded to grass. Soil is usually pushed up from the downhill side to build it; since much less soil is moved to build this terrace, it costs 50 to 70 percent less than the grassed backslope type. The terrace is best on fields with less than 12 percent slope.

Farming Terraced Land

After Construction

After the terraces are built, the entire terrace area, except the backslope, should be chiseled to loosen compacted soil.

Fertilize the area with:

____ lbs./ac. lime (ECCE)

____ lbs./ac. nitrogen (N)

____ lbs./ac. phosphate (P_2O_5)

____ lbs./ac. potash (K_2O)

Seed the backslope with:

____ lbs./ac. ____________________

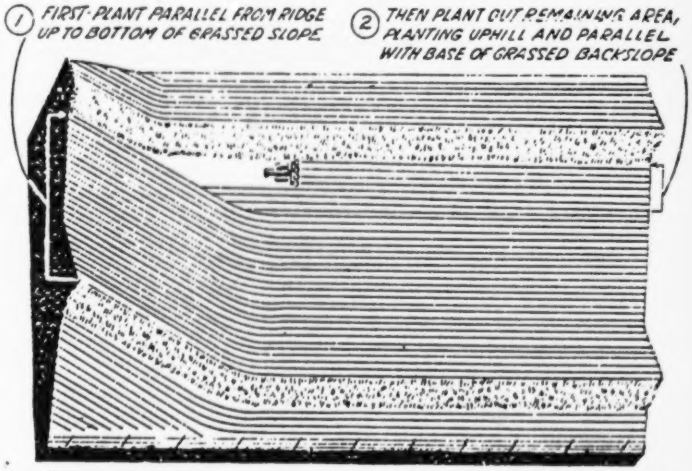
____ lbs./ac. ____________________

Planting

Where terraces are parallel, there is little trouble with planting. If terraces are not the same length, plant from the longer terrace to the shorter one.

If terraces are not parallel, short rows should be kept between terraces rather than turning on terraces. Rather than turning on crops, the short row correction area could be left in grass.

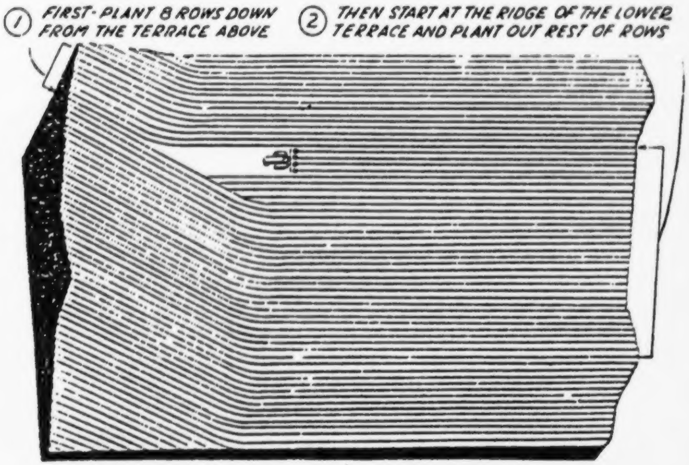
The backslope, or downhill side, of grassed backslope and narrow base terraces are not farmed. Be careful not to crowd these grassed areas with farming operations. Another precaution: be careful that farming operations do not build ridges around intake pipes when til outlets are used. The ridges could block complete drainage of the terrace channel.



① FIRST- PLANT PARALLEL FROM RIDGE UP TO BOTTOM OF GRASSED SLOPE

② THEN PLANT OUT REMAINING AREA, PLANTING UPHILL AND PARALLEL WITH BASE OF GRASSED BACKSLOPE

PLANTING CORRECTION AREAS BETWEEN GRASSED BACKSLOPE TERRACES



① FIRST- PLANT 8 ROWS DOWN FROM THE TERRACE ABOVE

② THEN START AT THE RIDGE OF THE LOWER TERRACE AND PLANT OUT REST OF ROWS

PLANTING CORRECTION AREAS BETWEEN BROAD BASE TERRACES

Maintaining Terraces

All Terraces

Plowing between terraces is not recommended. Plowing increases sheet erosion with a resulting increase in sediment in the terrace channel. On the terrace itself, to maintain capacity, plow toward the ridge and leave the finishing furrows in the channel bottom. Do not cross the terrace ridge with farm equipment; one low point weakens the entire terrace.

Broadbase

Terrace capacity can be maintained by plowing a dead furrow in the channel and a back furrow on the ridge. Construction equipment should be used for more extensive rebuilding.

Grassed Backslope

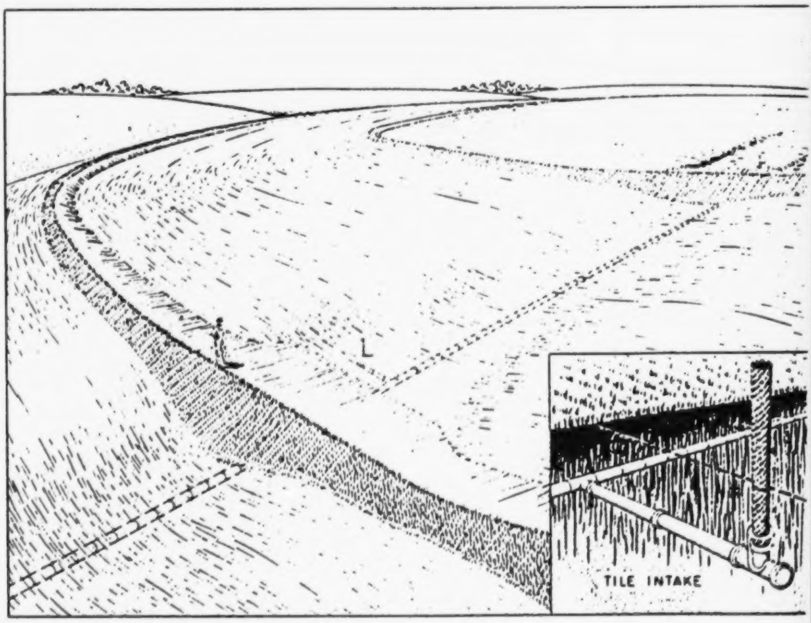
The terrace ridge will occasionally have to be raised by extra plowing or by construction equipment. It is very important to keep good sod on the backslope. Trees, brush, and weed growth should be controlled by spraying or by mowing if possible. Keep gophers and burrowing rodents out and fertilize occasionally to keep the sod vigorous.

Narrow Base

The channel will occasionally need to be cleaned out but it is not feasible to plow the terrace itself. Construction equipment will be required for major rebuilding. Good vegetation is even more important than with a grassed backslope terrace. Because of the small width of the ridge, protection from erosion and other damage is very critical.

Underground Outlets

Check tile intakes periodically; remove debris and sediment. The intake may have to be extended as the terrace basin fills with sediment. The ridge of the storage basin must be raised or the sediment cleaned out periodically to maintain design storage in the basin. Check the tile line between and below terraces for blowouts and repair as needed. Continuing blowout problems may be the result of a system overload, and design changes may be required.



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ESTABLISHMENT OF VEGETATION ON GRASSED WATERWAYS

Waterways must be (1) designed to carry the water, (2) constructed properly, (3) covered with a dense, tough sod to protect the channel from erosion, and (4) maintained year after year.

WHEN TO SEED WATERWAYS

The best time to seed grassed waterways is in the early spring or late summer. Seed in spring before May ___. After the hot summer period, start seeding again in August and complete before September ___.

During summer months, protect waterway by growing an annual crop such as corn, sorghum or sudangrass. Mow high and drill permanent grass seed in the standing stubble. Following the permanent seeding date in September, sow cereal rye at two bushels per acre before October 10. Disk to kill rye and prepare a seedbed the next spring before seeding permanent grass mixture. As another option, kill the rye with a contact herbicide and no-till into the existing residue.

PREPARE A FIRM SEEDBED

After the waterway has been properly designed and shaped, make a firm seedbed 3-4 inches deep. Use a roller or cultipacker to smooth and firm seedbed before planting. Temporary diversions may be used to protect seeding during establishment.

USE FERTILIZER

Apply lime as needed, at _______ lbs. ECCE per acre. A heavy application of fertilizer is needed to get the grass and a dense sod started quickly. Work into the soil _______ lbs. of nitrogen, _______ lbs. of phosphate (P_2O_5) and _______ lbs. of potash (K_2O) per acre of waterway. A liberal amount of barnyard manure may be added in addition to, but not in lieu of, the commercial fertilizer.

SEED A SUITABLE GRASS MIXTURE

Use two or three times more seed than ordinarily used for meadow seedings. Oats may be seeded at one bushel/acre with the grass seed during the spring seeding period if mowed before heading. Seed _______ lbs. of ______________, _______ lbs. of ______________ and _______ lbs. of ______________ per acre of waterway. Control depth of seeding. Place legumes and grass seed 1/4 to 1/2 inch deep.

Switchgrass and big bluestem are tolerant to many herbicides after establishment, and should be considered as part of the seeding where herbicide runoff has been or is likely to be a problem.

MULCH AFTER SEEDING

After seeding, spread a light mulch of straw or grass hay at the rate of two tons per acre. Unless the mulch is well anchored in the center of the waterway, spread only on the outside of the flow area of the waterway.

Cultipack the waterway again to cover the seed and to press the mulch into the soil. The mulch can also be anchored with a straight disk, rotary hoe run backwards or other suitable farm implement. Do not disturb the firm seedbed while anchoring mulch.

WATERWAY MAINTENANCE

Proper care and maintenance of a waterway is critical to its successful operation and long life. Establishment of a healthy sod is only the beginning and must be followed by regular maintenance and careful tillage. The following items are all important considerations in maintaining a waterway.

MAINTAIN A DENSE SOD

Apply nitrogen fertilizer or manure to promote top growth. A short dense cover provides an efficient liner for waterways. Access by animals, especially hogs, should be carefully controlled. Top dress with ________ lbs. of nitrogen per acre each year. Maintain designed top width of waterway in sod to prevent future erosion.

If wet, tile drainage should be provided. The tile should be to the side of the waterway and placed at least 2.0 feet lower than the center of the waterway. Depending upon site conditions, a tile line may be needed on each side of the waterway. When two tile lines are used, the maximum spacing between lines should be 70 feet.

Waterways should be mowed periodically to produce a short dense, high quality sod. Avoid any mowing operation until after July 1 to promote ground nesting bird habitat.

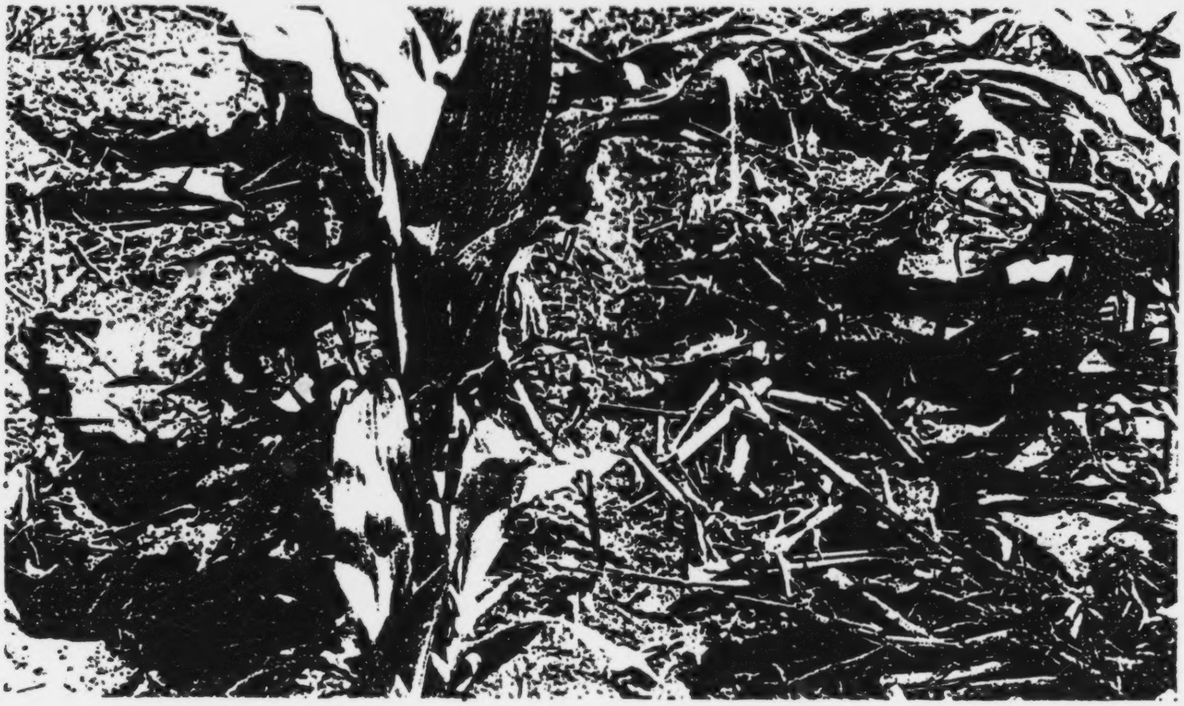
REPAIR WHEN NEEDED

Damage to waterways can be prevented by placing a little sod in the right place at the right time. Remove rocks, weeds, tree limbs, and other obstacles that cause concentration of flow and cutting. Repair all breaks immediately.

PROTECT THE WATERWAY

Lift farm implements when crossing waterways. Till soil at right angles to the waterway, never parallel to it. Stagger ends when tilling to prevent the water from forming new channels on either side of the existing waterway. Don't use waterway for roadway. Shut off farm chemical sprayers when crossing waterways and insist custom chemical applicators do the same.

Cut soil losses with
Conservation Tillage



Why

Conservation tillage, or leaving protective crop residues on the soil surface, can generally cut soil losses in half. The residues cover the land until the growing crop is tall enough to reach across the rows and provide soil cover.

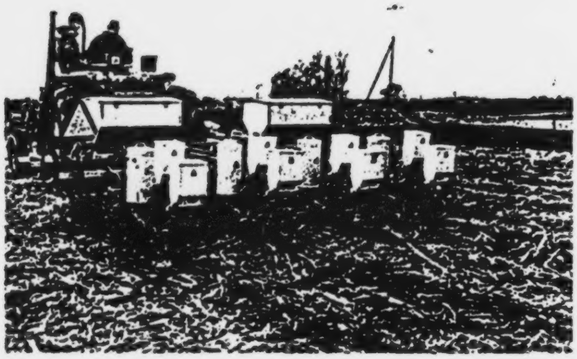
Crop residue left on the soil surface after planting protects the soil from the beating action of falling raindrops. Residue left at or near the surface increases infiltration of water into the soil and slows runoff from the field.

NOTE: CONSERVATION TILLAGE WORKS BEST ON SLOPING LANDS WHEN USED WITH CONTOURING AND TERRACING.

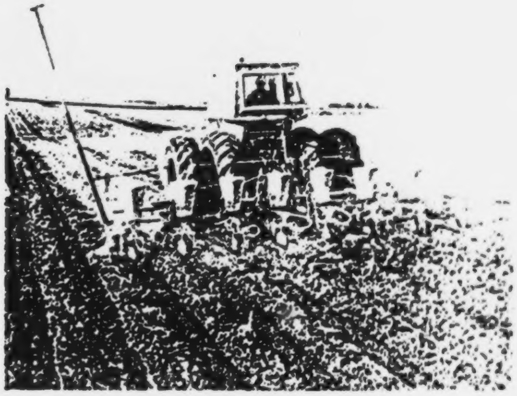
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

IOWA JOB SHEET AGRON-3
FEBRUARY 1977

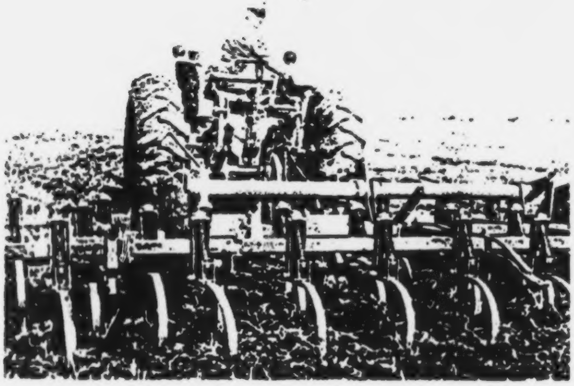
Tillage Systems



No Till This system of planting gives minimum soil disturbance and maximum crop residue cover. The seedbed is prepared in the row only with a special planter attachment, and the seed is planted with a single trip over the field.



Till Plant No disking or other seedbed preparation is needed with this system. In a once-over operation, the seed is planted in the ridge of last year's crop row. An 8 to 10 inch band of soil in the row is disturbed, leaving the rest protected with residue. DO NOT TILL PLANT UP AND DOWN HILL.



Chisel plow This system disturbs all the soil in seedbed preparation. Heavy textured soils often work best when fall chiseled. Other tillage tools, including tandem disks and field cultivators, are often used to smooth the field before planting. Limiting these trips over the field leaves more residue for soil protection. Planting is a separate operation.

Other Other farm equipment, including disks, field cultivators, and rotary type equipment, may also be used to leave crop residue on the soil surface. Avoid overusing these machines, since residue is easily buried.

Plan Ahead

Conservation tillage and conventional equipment are not always compatible. Planting and cultivating equipment may need to be modified.

Fertilizer must be applied as needed, just as with conventional tillage. How to apply and incorporate will vary with the system chosen.

The proper herbicide must be chosen for use with a particular tillage system. Time of applying and method of incorporating may differ from conventional planting where residues are buried. If weed control with herbicides is not certain, be prepared to cultivate with a machine designed to work in crop residue.

Some weather and field conditions may cause insect or disease problems. Special controls may be needed for grassy weeds (insect problems) or during cool, wet weather (disease possibilities).

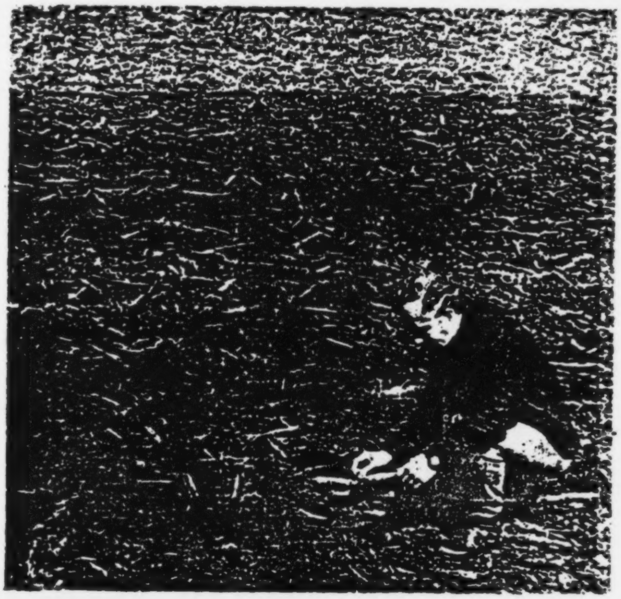
Advantages

Early Planting	- Seedbed preparation and planting can be done in one operation. When soil is ready to plow, it's ready to be planted. Planting can be completed with conservation tillage systems before conventional systems are well underway.
Save time	- Fewer trips over the field mean covering more ground in less time with conservation tillage systems.
Save fuel	- Fewer trips also save diesel fuel and gasoline. Some conservation tillage machines take much less power.
Save soil and moisture	- Crop residue cover slows moisture evaporation in dry weather. It reduces soil loss in wet periods.

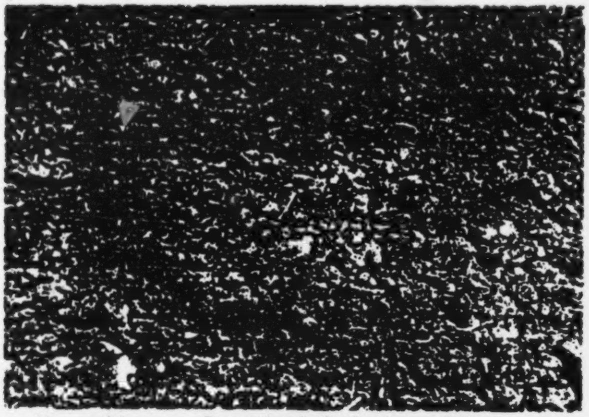
How much residue?

____ lbs/acre needed on field ____

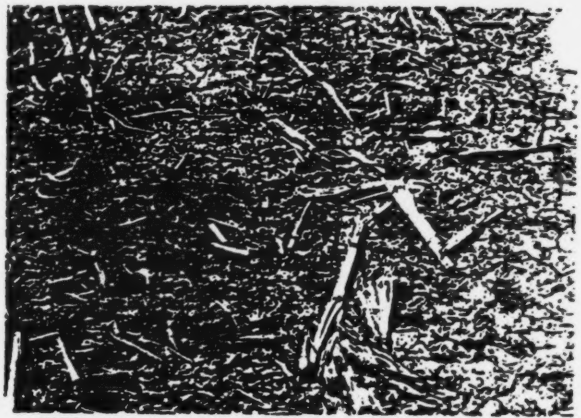
____ lbs/acre needed on field ____



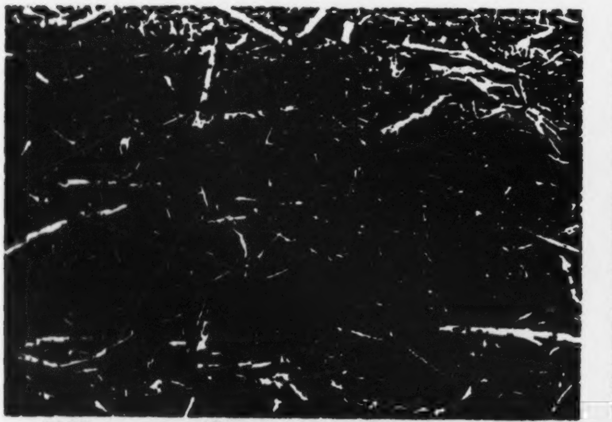
Broader view of 3000 pounds of residue per acre. A good tillage system leaves this much residue.



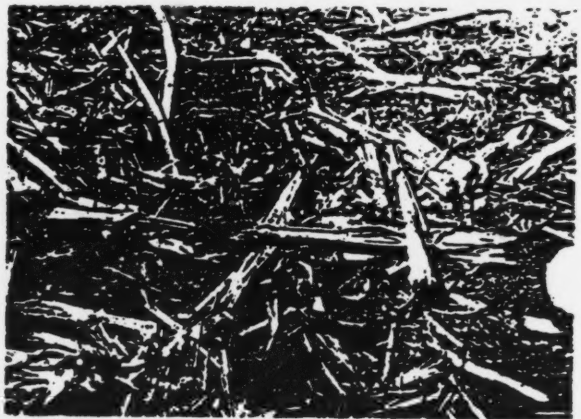
No residue Conventional plowing leaves little or no residue on the soil surface.



1500 pounds per acre At least this much residue must be left to save soil with conservation tillage.



3000 pounds per acre This amount of residue cuts soil loss to half that from conventional forms of tillage.



5000 pounds per acre On longer and steeper slopes, more residue is needed to control erosion.

CRITICAL AREA PLANTING

Soils exposed during construction of conservation practices must be revegetated to prevent erosion and failure of the practice. This protection must be provided as quickly as possible. Other areas contributing sediment to streams and lakes also need to be seeded to provide a cover of permanent vegetation.

PREPARATION BEFORE SEEDING

If possible, divert any off-site water away from the exposed area. Then prepare a good, friable, firm seedbed to a depth of three inches. Add limestone at the rate of ________ lbs. ECCE per acre and the equivalent of ________ lbs. nitrogen, ________ lbs. phosphate and ________ lbs. potash per acre. Work into seedbed. Firm seedbed with a roller or cultipacker before seeding. On sites that are too steep for regular seeding equipment to operate, hydro seeding may be a good option.

SOWING THE SEED MIXTURE

Drill or broadcast seed immediately following seedbed preparation. Drilling is the preferred method. Firm and cover seed with a roller after seeding.

Seed a suitable seed mixture. Seed ________ lbs. of ____________________, ________ lbs. of ___________________, ________ lbs. of __________________ and _______ lbs. of ___________________ per acre. If mulch is not applied, seed not more than one bushel of oats per acre as a companion crop. Mow companion crop before heading. Inoculate legumes with the inoculant specific for that legume. Control depth of seeding. Place legume and grass seed 1/4 to 1/2 inch deep.

MULCHING FOR SOIL PROTECTION

Apply mulch to prevent erosion until the new grass provides adequate protection. Apply cereal straw or grass hay at the rate of ________ tons per acre. To prevent mulch from blowing or washing away, anchor with a straight disk or notched coulter equipped machine. Do not disturb planted seeds while tacking the mulch.

TIME OF SEEDING

The best time to seed is in the spring. Some species can be sown in late summer. Seed before ________________ in the spring. In the late summer begin seeding after August 1 but not later than ________________. After the late summer seeding period is past; lime, fertilizer and mulch may be applied for winter protection. Seed may be sown on partially frozen soil in late February and early March. Freezing and thawing will cover the seed.

TEMPORARY SOIL PROTECTION DURING THE SUMMER MONTHS

Permanent grass seedings usually fail when seeded during the hot summer months. In June and July seed a temporary cover of oats (three bushel/acres), corn (three bushel/acres) or sudangrass (35 pounds/acre). Disk residue into the soil when preparing a seedbed for late summer seedings or plant into existing residue with a no-till drill. Seed permanent grass mixture as listed above. This temporary cover may also be left over winter and permanent grass mixture applied as a frost seeding.

MAINTENANCE AFTER SEEDING

Critical area seedings are often located on extremely fragile soils. Careful attention to maintaining a vigorous stand of vegetation insures successful erosion control on all critical areas and a long life for conservation practices.

GRAZING

Do not graze the area the first year after seeding. If necessary, fence to control over grazing by livestock in subsequent years.

WEED CONTROL

Mow or apply herbicides to control unwanted or noxious weeds. Always read and follow all label directions when using herbicide. Warm season grass plantings may benefit from controlled fire designed to eliminate weedy competition and invigorate the native grasses. This burn should be done in the spring of the year and follow a detailed burn plan.

FERTILITY

After vegetation is well established apply 50 pounds of nitrogen (N), 20 pounds of phosphorous (P_2O_5) and 20 pounds of potassium (K_2O) each spring. If legumes are in the mixture, eliminate the nitrogen and apply 60 pounds of phosphorous (P_2O_5) and 60 pounds of potassium (K_2O). Warm season grasses should not be fertilized before they begin growth which will often be three to four weeks later than the more common cool season grasses.

MULCHING

Mulching is the practice of applying plant residues or other suitable materials to the soil surface in order to conserve moisture, prevent surface compaction or crusting, reduce runoff and erosion, control weeds, and help establish plant cover.

The type of mulching material selected should be based on site conditions including: availability, soils, percent slope, economics, time of year, and landscape position.

Mulch Material	Area to be Covered		Amount Needed	Anchoring Method
	Acre	Sq Ft		
Straw, Native Grass Hay				
Wood Fiber				
Long Wood Fiber Excelsior				
Sawdust and Corn Cobs				
Wood Chips or Shavings				
Excelsior Wood Fiber Blanket				
Chopped Straw Mat				
Plastic				
Peat Moss				
Other ________________				

Location Map: T_____ R_____ Sec_____ Description ________________

Anchoring Methods

1. Mulch Anchoring Methods

a. Mulch Anchoring Tool or Disk (serrated blades) - Apply mulch and pull a mulch anchoring tool over mulch. Use equipment with serrated straight disks spaced 6-10" or other suitable equipment approved by the technical agency. Operate as close to the contour as possible. Mulch material should be tucked into the soil surface 2-3". Use on areas without concentrated flow or when concentrated flow velocity is less than 4 feet per second.

b. Wood Cellulose Fiber - Apply with a hydromulcher immediately after mulching. Reduce mulch applications to 3,000 lbs. per acre and apply 750 lbs. of wood fiber per acre with a non-toxic, biodegradable tackifier. Use on areas without concentrated flow.

c. Asphalt Spray (emulsion) - Apply with suitable equipment to spray asphalt into the mulch as it is applied. Material shall conform to the requirements of ASTM Specification D977. Application rate is 0.5 gallons per square yard (242 gallons per acre). Material shall be non-toxic to plant life. Use on areas without concentrated flow.

d. Tackifier or Binder - Method and rate of application shall be according to manufacturer's recommendation. Use on areas without concentrated flow.

e. Polypropylene Plastic Netting - Apply plastic netting over mulch and staple with 11 gauge or heavier wire staples. Use on areas without concentrated flow or when concentrated flow velocity is less than 4 feet per second.

f. Peg and Twine - After mulching, divide area into blocks approximately one square yard in size. Drive 4-6 pegs per block to within 2-3" of the soil surface. Anchor mulch by stretching twine between pegs in a criss-cross pattern on each block. Secure twine around each peg with two or more turns. Drive pegs flush with soil surface to allow mowing.

g. Slit - Cut mulch into soil surface with square edge spade. Make cuts in contour rows spaced 18" apart.

h. Soil and Stones - Bury edge of plastic in a trench 6" deep. Firm soil over plastic. Use stones to hold plastic down in other places as needed.

2. Placement and Anchoring of Netting and Matting - Follow instructions provided by manufacturer.

General Instructions: On slopes, mats and nets may be run either up and down or cross slope. In areas of concentrated flow, mats and nets shall be laid parallel to the direction of flow. Spread evenly without stretching to allow maximum contact with the soil. Adjacent edges should be overlapped 3" with the upgrade mat or net on top. Staples of 11 gauge or heavier will be used to hold the mats and nets in place. Staples shall be U shaped with a 1" crown. Staple length shall be determined by soil condition as follows: Highly compacted soils - 6", Friable soils - 8", Loose or Sandy soils - 10". Outside edges of mats and nets will need to be buried in a trench. Mat and net edges and middles will be stapled according to manufacturer's recommendations.

CONTOUR STRIPCROPPING

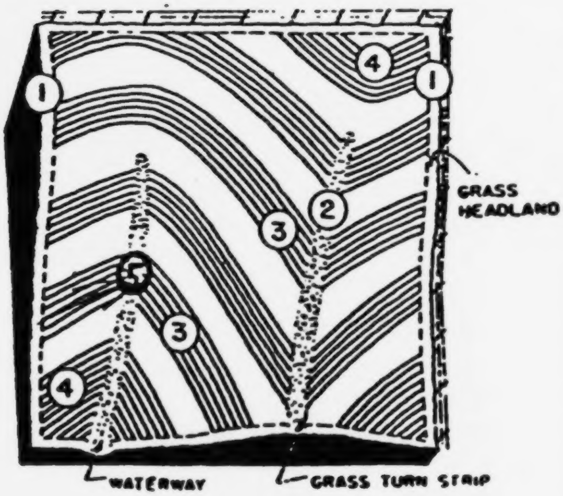
Contour stripcropping is a system of growing crops in approximately even width strips or bands on the contour to reduce soil erosion. The crops are arranged so that a strip of grass or close growing crop is alternated with a strip of row crop or a strip of grass is alternated with a close growing crop.

Contour stripcropping is very effective at reducing soil loss. It may reduce soil loss as much as 75%, depending on the type of crop rotation and the percent land slope.

To be effective, contour stripcropping should be used with the conservation practices of grass waterways, contouring, grass headlands, and crop rotation. Other practices that may be used and/or needed include conservation tillage, diversions, terraces, and water and sediment control basins.

A conservation plan developed with the local Soil Conservation Service office is important for contour stripcropping success. Depending on landowner/operator needs, a conservation plan can provide a field by field schedule for implementing a stripcropping system. It can present a planned rotation which will balance annual acres of crop production. The plan will show the strip width necessary to fit machinery and provide optimum erosion control.

FARMING CONTOUR STRIPS



1. It is important to plant headlands in places where there would normally be end rows. This reduces erosion that may occur in these areas and provides important travel lanes during haying or small grain harvest.

2. Leave grass turn strips where turns become sharp. Turn strips should be wide enough to make a turn with tractor and equipment.

3. To be most effective, not more than half the field should be in row crop any one year. Also, to balance the acres of crop production, the years in the crop rotation divided by 2 should equal the number of stripcropped fields or units. The fields or units should be as close to the same size as possible. Example: A CCOMMM rotation would work best with three fields or units of equal size.

4. Most contour stripcropped fields will have odd areas. Odd areas should be tilled and planted parallel to adjacent strips. This will help runoff water move slowly off the field. Odd areas can also be used for hay production or wildlife habitat.

5. Grass waterways will need to be established and/or maintained. They are important for safe disposal of excess surface water. Lift tillage equipment and turn off spraying equipment when crossing waterways.

Contour Stripcropping

Name____________

Date____________

Location__________

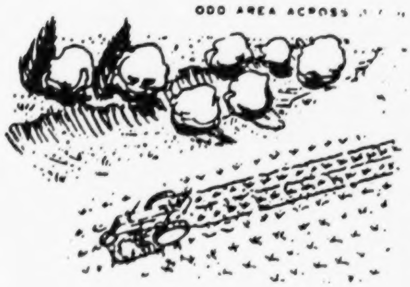
Planned Rotations __________

Planned Crop Rotation by Year

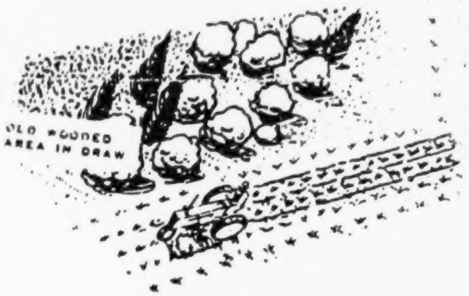
Unit	Ac	Field	Ac								

ODD AREA DEVELOPMENT AND MANAGEMENT FOR WILDLIFE

Areas such as ditches, abandoned roads, railroad right-of-ways, borrow pits or unused portions of cropland can be developed and managed to provide food and cover for many species of wildlife. Often, protection from grazing and uncontrolled fire is all that is needed to make an odd area excellent wildlife habitat.



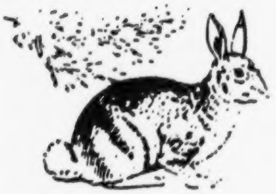
Winter cover, nesting cover for ground-nesting birds and food are three important items to consider when developing habitat for Iowa's upland game.



Winter Cover

When possible locate these areas on south and east slopes since they are the warmest during the winter. Design these areas to be as snow free as possible. Avoid long narrow plantings which fill with snow more readily than square ones.

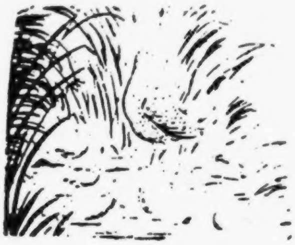
Plant shrubs 3 to 6 feet apart in clumps of 15 to 50. Plant conifers 6 to 10 feet apart in clumps of 5 or more. Do not plant more than half the area in woody cover.



Select only planting stock that is adapted to the site and always include evergreens if possible, since their low hanging branches provide some of the best winter cover for wildlife. Provide adequate distance between evergreens so their lower limbs will not be too shaded and die. When possible, plant a variety of shrubs or trees to help reduce chance of loss from disease.

Annual winter cover can also be provided with sorghums, sweet clover and standing corn. Standing corn is especially well adapted to areas with extreme drifting snow.

Nesting Cover



Most grasses provide some nesting cover for wildlife. A grass-legume combination such as bromegrass and alfalfa provides especially good nesting cover. Oats, red clover, and warm season grasses are other good possibilities. If mowing is required for management, do not mow before July 1st and somewhat later if possible to allow ground nesting birds to leave the area. Protect from grazing at all times.

Food

The easiest method of adding food to odd areas is to leave a few rows of grain standing in crop fields adjacent to the odd area. Corn and sorghum are especially good since they can stand above most snow drifts. All grain producing plants offer some food for wildlife. If food isn't available in adjacent crop fields, try planting a few rows in the odd area. Be sure to use conservation tillage methods when planting to control soil erosion.

Don't overlook the many wild foods that may be growing in the area such as sunflowers, wild grapes, elderberry, hazelnut, raspberry and sumac. They can also be planted in the odd area.

Maintenance

Protect from grazing and uncontrolled fire at all times. Do not allow woody vegetation to invade and take over the grass areas. Diversity of grass, shrubs, trees and food is the key to quality upland wildlife habitat.

Recommended plants for wildlife habitat

____

____

____

Lime and/or fertilization requirements ____________________________

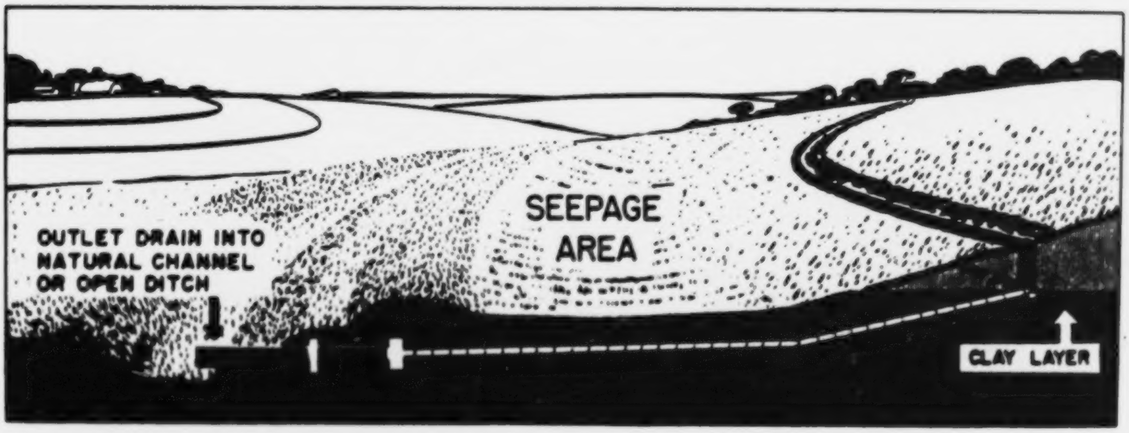
____

____

____

DRAINING HILLSIDE SEEPS

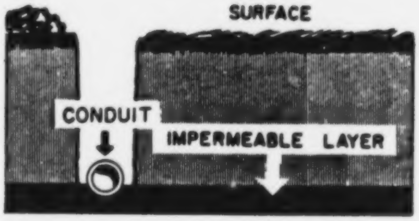
These step-by-step instructions will supplement technical help in carrying out the conservation job on your farm.


SEEPAGE AREA
OUTLET DRAIN INTO NATURAL CHANNEL OR OPEN DITCH
CLAY LAYER

The condition illustrated above is corrected by laying a subsurface drain above the wet area to intercept the water seeping to the surface.

The first step is to locate the impermeable layer which is causing the trouble. This can best be done by making a series of borings around the hillside. The impermeable layer will have a finer texture and a tighter, heavier appearance and feel than the overlying soil. While this boring can be done by hand, either with a regular soil auger or post hole auger, it is faster and easier to use a tractor post hole auger, if available. As the borings are made the location and depth to the impermeable layer should be put on a map showing their relation to field boundaries. When sufficient borings have been made to adequately locate the impermeable layer, the location of the drain can be decided.

The conduit should be 3 to 4 feet deep, if possible, and on or near the impermeable layer at all times. More than one line may be necessary if the impermeable layer is uneven. The subsurface drain must have an outlet into an existing system or into an open channel. Since the amount of water which will be handled from the seepage area is comparatively small, regular drain materials can be used although the slope may be steep.



Conduit should be laid just on or just into tight soil, if possible.

Some Good General Practices

1. After the conduit is laid, have the grade checked with a surveying instrument.
2. Blind all conduits with topsoil.
3. As soon as practical after backfilling, seed the area to prevent erosion.
4. Make a map showing the location of the new drain with respect to permanent landmarks.
5. If the drain must cross a waterway or ditch, use a corrugated metal or other rigid pipe for that section to prevent erosion of the line.

October 1978

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Des Moines, Iowa

IOWA EN JOB SHEET
NO. IA-40-8

SUPERVISED AGRICULTURAL EXPERIENCES

B. Improvement Projects

3. **WHAT** - Conduct a poster campaign to publicize the benefits to the Food Security Act Program and steps farmers must follow to qualify.

WHO - Individuals, groups of students or chapter (Could be a part of a BOAC project)

WHY - To help inform farmers what they must do to remain eligible for USDA benefits.

WHERE - Post on community bulletin boards.

WHEN - Prior to January 1, 1990

HOW -

A. Use the fact sheets included in the references of this handbook or the video "How to Stay Eligible" included in the 1988-89 IVATA materials to develop a step by step check list for farmers.

B. Make drawings, artwork or cut out pictures to use in the posters.

C. Make arrangements for and post on community bulletin boards.

SUPERVISED AGRICULTURAL EXPERIENCE

C. Productive (Ownership and Placement) Enterprises

1. **WHAT** - Manage 1 or more highly erodible fields to remain eligible for the Food Security Act (Ownership)

   WHO - Individual Student

   WHY - To gain experience (first hand) in working with a new farm program (Food Security Act 1985) and planning and applying conservation sytems. To insure that the conservation systems are applied by January 1, 1995.

   WHERE - On the student's farm or some other farm (could be a piece of public land).

   WHEN - In sufficient time to allow needed conservation systems to be applied on highly erodible fields by January 1, 1995.

   HOW -

   a. Following the teaching of The Conservation Provisions of the Food Security Act and The Developing of Conservation Planning Skills for Food Security Act of 1985 (Instructional plans included in this handbook).

   b. Following the development of a conservation plan by the student, with assistance from the Soil Conservation Service, have the official conservation plan completed.

   c. Arrange for and carry out crop production, tillage operations and conservation practice applications.

   d. Assist in making application for government programs.

   e. Evaluate, based on whether the conservation systems were applied as planned to remain eligible for the USDA programs.

SUPERVISED AGRICULTURAL EXPERIENCES

C. Productive Enterprises (Placement)

2. **WHAT** - Work as a volunteer for the Soil Conservation Service. (See page 2-4.2)

   WHO - Individual Student

   WHY - Gain on-the-job experience to use in career development and get satisfaction out of providng a contribution to public service and soil and water stewardship.

   WHERE - Apply at the U.S. Soil Conservation Service office located in each county.

   WHEN - Part-time throughout the year and/or during the summer months.

   HOW -

   a. Contact the local SCS office and talk to the District Conservationist to determine if they have a need for volunteer help (The student may be especially needed to help with the Food Security Act workload).

   b. If the SCS office has a need, the student would need to fill out an application and indicate what type of volunteer assistance that will be provided and what hours or period of time the student will be working.

   c. Determine if it will be inside office work, field work or both so the student can dress appropriately.

   d. The student should make a good impression by: (1) being prompt, (2) take responsibility to carry out assignments with good quality work (Successful volunteer work will look good on a resume - the student may decide the conservation field would make a good career).

   e. This relationship of a student volunteering for work with SCS would make a good news release.

   f. Evaluate, based on the District Conservationist's performance evaluation of the student.

. . . join a Professional Conservation Team.

The Earth Team is a group of concerned citizens, like you, who are interested in learning more about our nation's soil and water resources and how to help conserve them.

This nationwide volunteer service group is sponsored by the USDA Soil Conservation Service and local Conservation Districts through more than 3,000 locations across the country. Volunteers must be 16 years of age to join. *All* volunteers receive a permanent work record of their service as well as liability protection.

Right now our professional conservationists are working to develop conservation plans for farmers and ranchers across the country and skilled volunteers are needed to help. There are dozens of jobs you may be qualified to do!

The Earth Team needs volunteers with skills and time to share:

In the Community —
- Conservation Planning
- Photography
- Conservation Education
- Writing
- Special Tours and Fairs

On the Land —
- Soil Mapping
- Surveying
- Water Sampling
- Establishing Wildlife Habitat
- Native Grass Seeding
- Resource Inventories

In the Office —
- Drafting
- Computer Data Entry
- Map Interpretations
- Filing
- Telephoning
- Editing

To receive more information simply fill in this card or contact your nearest Soil Conservation Service Office:

Name______________________________

Address____________________________

City_______________________________

State____________________ Zip_________

INTRODUCTION TO FFA ACTIVITIES, CONTESTS AND AWARDS

Unit III contains FFA activities associated with natural resource recognition opportunities and contests. This unit is divided into two sections: (1) Individual and Team and (2) Chapter.

The section labeled Individual and Team contains recognition and competitive activities available to individual teachers, students and groups or teams of students in the areas of soil, water and other natural resource conservation. Included in the section are basic descriptions of national, state and local contests and awards programs.

The chapter section contains chapter activities such as the (BOAC) Building Our American Community project that could be planned and carried out in promoting soil, water and other natural resource conservation. Reference is made to ag skills, improvement projects and productive enterprises in Unit II in integrating individual activities with the chapter project.

FFA ACTIVITIES, CONTESTS AND AWARDS

A. Individual and Team

1. **WHAT** - District, State and National FFA Soil and Water Contest and Awards Program

   WHO - For students (John Brian Priest from Creston was the National 1987 winner in the soil and water management proficiency awards program). Sponsored by the National FFA organization and the Iowa Association of FFA, through the National Association of Conservation Districts and the Iowa Association of Soil and Water Conservation District Commissioners.

   WHY - To recognize outstanding proficiency in the area of soil and water conservation.

   WHERE AND WHEN - This is a state and national contest with awards presented at the State and National conventions in addition to the recognition for the proficiency awards given through the Iowa Association of Soil and Water Conservation District Commissioners Annual Conference in December and the National Association of Conservation Districts Convention in February.

   HOW -

   A. Soil and Water Conservation proficiency can be effectively demonstrated in the following Agriculture Proficiency Award categories: Diversified Crop Production, Feed Grain Production, Fiber Crop Production, Forage Production, Forest Management, Oil Crop, Outdoor Recreation, Soil and Water Management and Wildlife Management. This contest is based on documented evidence of a proficiency developed overtime by an FFA member.

   The FFA Soil and Water Management Contest is judged on the individual proficiency developed by an individual with programs that help members plan and use management practices that will improve the productivity of the soil, prevent erosion, promote the efficient use of water resources and the reduction of air and water pollution. This would include programs in which a member was involved to help stimulate public awareness and to assist in education of the public concerning pollution problems.

B. Other State FFA Leadership and Agriculture Improvement Awards.

The following are other FFA participating events, where soil, water and other natural resources conservation themes may be used:

1. Prepared Public Speaking
2. Extemporaneous Speaking
3. Parliamentary Procedure and Conduct of Meeting

Topics could including the following:

- Should the FFA chapter assist the Soil and Water Conservation District with the Food Security Act awareness program, promotion of Soil and Water Stewardship week, promotion of Soil Conservation Week, a BOAC Community Development program to enhance soil and water conservation in the community (or what would be the benefits of these programs?)

- Should the chapter plant trees on Arbor Day or what are the benefits of this program?

- Should the chapter devote a portion of the land laboratory to the demonstration of managing conservation reserve fields or what are the benefits of the Conservation Reserve Program?

- Should the chapter use no till on their corn plots or what are the advantages of using no till?

C. Agriculture Mechanics Contest (team contest). Agriculture Construction and Soil and Water Conservation Areas of competition by year:

1988 - Soil and Water Management (conservation practices drainage and irrigation)

1989 - Conservation planning, land use, measurement and leveling

Each contestant must participate in the following events: hands-on performance (skill) 40 minutes, problem solving (gathering of information and logical solutions) 20 minutes, and written examination (90 multiple choice questions - 30 in soil and water) 60 minutes.

D. Computers in Agriculture Award. The computer program could be on the theme of natural resources with topics such as:

- The Universal Soil Loss equation providing answers for what conservation systems would be available to use on a specific highly erodible field to remain eligible for the Food Security Act.
- A spread sheet to keep records and or evaluate a field planted using reduced tillage or no till.
- An evaluation for a farmer to use in weighing the monetary benefits of participating or not participating in the Food Security Act.
- A program listing benefits for selected management options in using conservation systems such as: what are the advantages and disadvantages to using contouring, contour strip cropping, terraces, reduced tillage, conservation tillage, grass headlands, etc.

FFA ACTIVITIES, CONTESTS AND AWARDS

A. Individual and Team

2. **WHAT** - (ISCAP) Iowa Soil Conservation Achievement Program - Teacher Division II (Grades 9-12)

WHO - For teachers (Gary Vrba, Voc. Ag. Teacher at Crestwood High School, Cresco, Iowa, was the 1987 winner) it was sponsored by: Iowa Conservation Education Council, Des Moines Register and the Iowa Association of Soil and Water Conservation District Commissioners.

WHY - To recognize outstanding teaching in the field of Conservation. Teachers who are performing outstanding service, creating public awareness through classroom activities of the need to protect our natural and human resources.

WHERE - Recognized at the Iowa Association of Soil and Water Conservation District Commission's Annual Conference.

WHEN - Usually held around December 1 of each year.

HOW -

a. Close cooperation with the local Soil and Water Conservation District, Extension Service, County Conservation Board and publicity through news media will enhance public awareness.

b. Evidence of effective teaching of natural resource subjects, resulting in motivated students in the field of soil, water and other natural resource conservation is an important criteria used in selecting award winners.

c. Local, Soil and Water Conservation Districts nominate teachers for the award. Check with your local District Conservationist for details.

3. **WHAT** - Conservation Essay Contest ($1,600 in prizes awarded annually).

WHO - Students, contest sponsored by the Iowa Soil and Water Conservation District Commissioners Auxiliary and the Grinnell Mutual Reinsurance Company.

WHY - To recognize students most effectively addressing the annual topic (A new topic selected each year). In 1988, the topic is "Groundwater - The Hidden Resource."

WHERE - Recognize at the Iowa Association of Soil and Water Conservation District Commissioners Annual Conference.

WHEN - Usually held around the end of November or the first of December of each year. Essays are due into the Soil Conservation District office by May 30.

HOW - See the accompanying flyer, pages 3-2.5 and 3-2.6, for detail and contact the local Soil Conservation District Commissioners for more specific information.

Deadlines are as follows:

A. Local schools will send their essays to the Soil and Water Conservation District office by May 30.

B. Local soil and water conservation districts will judge their contestants by July 1 and send to the respective regional director.

C. Regional judging will be completed by August 15 and winners sent to the Division of Soil Conservation.

D. Regional winners may be recognized at the IASWCDC fall regional meeting in September.

E. State winners will be judged by October 1.

F. State winners (first place only in each division) will be recognized and asked to read their essays at the Annual Conference for Soil and Water Conservation District Commissioners on November 28, 1988, in Des Moines.

1988 Topic

Groundwater — The Hidden Resource

How To Enter

Contact your local soil and water conservation district for entry information and contest deadline.

Contest Awards

PRIZES FOR REGIONAL WINNERS —
Senior Division — $40, First Place
$30, Second Place

Junior Division — $40, First Place
$30, Second Place

PRIZES FOR STATE WINNERS —
Senior Division — $100, First Place
$ 75, Second Place

Junior Division — $100, First Place
$ 75, Second Place

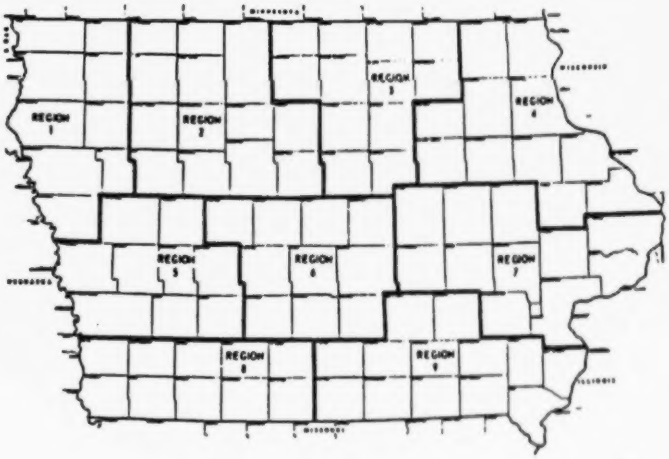
Prizes provided by GRINNELL MUTUAL REINSURANCE COMPANY

Essay Contest Rules

1. This contest is open to all students who are residents of the state of Iowa.
    a. Junior Division — grades 6, 7, 8
       Senior Division — grades 9, 10, 11, 12
    b. Entrants must compete in the contest conducted by the soil and water conservation district in which they reside.
2. The essays will have a maximum of 500 words (minor conjunctions and prepositions will not be counted).
3. All manuscripts will be handwritten by the competing student.
4. The essays will be judged on originality, aptness of thought, and accuracy of information. Overall appearance and correctness of grammar and punctuation will be included in judging.
5. A title page will be provided by the soil and water conservation district for use by competing students. A list of reference material used for the essay must be attached to the manuscript.
6. The state winners will be asked to read their essays at the Annual Conference for Soil and Water Conservation District Commissioners on November 28, 1988, in Des Moines.

Association of Soil and Water Conservation District Commissioners

Regions —
Soil Conservation
Essay Contest


REGION 1
REGION 2
REGION 3
REGION 4
REGION 5
REGION 6
REGION 7
REGION 8
REGION 9

1988 SOIL AND WATER CONSERVATION ESSAY CONTEST

Open to all Iowa School Students
in Grades 6 through 12

$1,610 in Prizes

Sponsored by the
Auxiliary of the Iowa
Association of Soil and Water
Conservation District Commissioners
and
Grinnell Mutual
Reinsurance Company

A. Individual and Team

4. **WHAT** - Conservation Education Awards Program

WHO - Teachers K through 12, sponsored by (NACD) National Association of Conservation Districts and Deutz-Allis Corporation.

WHY - To recognized teachers who are doing an outstanding job of incorporating environmental conservation education into their curriculum (with emphasis on soil conservation).

WHERE - Recognition and awards are presented annually at the State and National Association of Conservation District's Convention.

WHEN - The State Association of Soil and Water Conservation District Commissioner's Annual Conference is held the last of November or the first of December and the National Association of Conservation District's Convention is held in February each year.

HOW - See the accompanying information, page 3-2.8, for details. Additional information may be obtained from the local Soil and Water Conservation District.

NACD-DEUTIZ-ALLIS CONSERVATION EDUCATION AWARDS PROGRAM

Each year the National Association of Conservation Districts (NACD) and the Deutz-Allis Corporation co-sponsor the conservation awards. The purpose of the awards program is to recognize teachers and soil conservation districts that have effective programs in environmental conservation education.

All soil conservation districts with a conservation education program are eligible to compete for the Conservation District Award. Teachers of grades kindergarten through twelve that incorporate environmental conservation education into their curriculum (an emphasis on soil conservation helps) are eligible for Teacher-of-the-Year. The forms and rules for this contest are sent from NACD in the fall before the date they are due. The entries should be sent to the Department of Soil Conservation by April 1 of each year. The IASCDC Education Committee chairperson selects the committee that judges the entries. A photo of the winning teacher should be sent to the Department of Soil Conservation no later than April 1.

The national first place winning teacher receives a $1,000 cash award and an expense-paid trip to the annual NACD convention. The national second place winning teacher receives a cash award of $500.

The national first and second place conservation district winners each receive a plaque at the annual NACD convention. Also, the national first place district receives $500 to help in sending a representative to the convention.

Each teacher and district winner receives a plaque and a $200 check. A certificate will be presented to each state level winner.

A. Individual and Team

5. **WHAT** - Soil Judging Contest

WHO - Teams of students. Program and technical direction by Gerald A. Miller, Extension Agronomist, Iowa State University.

WHY - To stimulate interest in the science and soils and to develop expertise in the soil science field.

WHERE - Counties, regions, state and national locations selected annually.

WHEN - In the fall of the year.

HOW - Cooperative Extension Service Publication PM-1106, revised August 1986, entitled Soil Judging in Iowa gives a detailed description of technical information and procedures needed to prepare a soil judging team for the contest. Topics included are surface features of the landscape, soil profile features, land capability classification and productivity potential, evaluation of management practices and suitability of soils for non-agricultural uses.

A. Individual and Teams

6. **WHAT** - Volunteer Recognition

WHO - Individual students, instructors or a team of students and their instructor.

WHY - To recognize those who contribute time and effort in advancing the cause of soil and water conservation.

WHERE - At home location and at a selected state function and location.

WHEN - In the fall of each year or at another appropriate time. This recognition could be arranged for the FFA Banquet.

HOW - The U.S. Soil Conservation Service has been given authority to employ volunteers to assist them in planning and applying soil and water conservation systems. The volunteers has an official records of agency experience to use for future reference.

If the volunteer's service has been sufficient and worthy of recognition, the local Soil Conservation Service staff will forward volunteer names for consideration of recognition by SCS. If the volunteer provided sufficient service to the Soil and Water Conservation District, they will also be considered for a Governor's volunteer recognition which is administered through the State Division of Soil Conservation, Department of Agriculture and Land Stewardship.

For further details, contact the local Soil Conservation Service office.

FFA ACTIVITIES, CONTESTS AND AWARDS

B. Chapter

1. **WHAT** - BOAC (Building Our American Communities)

   WHO - Chapter working with key leaders in the community. Individual Ag skills and improvement projects can compliment the chapter project

   WHY - To develop individual and group skills in: (1) planning and carrying out a campaign to carry the message of the 1985 Food Security Act, or (2) planning and carrying out a campaign to educate the public in effectively applying conservation systems.

   WHERE - In the local community

   WHEN - In sufficient time to allow farmers to get a conservation plan developed by January 1, 1990, and get the plan carried out by January 1, 1995 (To remain eligible for the 1985 Food Security Act).

   HOW - Considerations for Planning a BOAC Soil and Water (Natural Resources) Conservation Project

   After you have organized a BOAC committee and chairperson; and have become familiar with the community development process:

   A. Meet with community natural resource leaders and other key people to help you:

      1. SURVEY: Identify community needs and resources. The following are potential resource contacts you could make: (a) District Conservationist, U.S. Soil Conservation Service, (b) County Extension Director, (c) your 5 Soil and Water Conservation District Commissioners, (d) your County Conservation Board and Staff, and (e) DNR District Forester and/or Wildlife Biologist.

      2. ANALYZE: Consider potential projects, refer to Unit II for experiences that will dove-tail into the BOAC projects. In cooperation with your resource contacts, consider potential projects such as:

  a. Carry out a campaign to promote low energy, cost effective soil saving crop production practices.
  b. Carry out a campaign to carry the message of the 1985 Food Security Act (Instructional plans have been furnished to ag teachers).
  c. Carry out a demonstration to show beginning farmers how to finance low energy, cost effective conservation alternatives.
  d. Carry out a campaign to promote the planting of wind breaks and wildlife areas on farms or public land.
  e. Carry out a campaign to promote participation in the 10 year conservation reserve program and opportunities for alternative sources of income following the 10 year idling of the CRP land.
  f. Design and carry out a program or programs to encourage soil conservation and water quality practices among local farmers.

3. DECIDE: Select a high priority project. Prioritize into community long range plans allowing you to use your community as a teaching laboratory for your Agricultural Science and Technology program.

4. PLAN: Develop the project plan. Call on your local resource contacts to give you ideas on financial and technical assistance. Your plan should address the questions who, what, where, when, why, and how?

5. ACT: Implement the plan. Insure the interaction of important resource people to coordinate into community planning activities for long range community benefits.

6. Resource contacts identified in item 1 can be of assistance in the next three steps: EVALUATION, COMMUNICATION and RECOGNITION. Your Soil and Water Conservation District, headquartered at your U.S. Soil Conservation Service Office in your county, should be interested in recognizing your soil and water conservation project.

B. Chapter

2. **WHAT** - Recognition of Soil and Water Stewardship Week

WHO - Chapter or individual project (could be a part of a BOAC project).

WHY - To publicize Soil and Water Stewardship week and provide a community service. To emphasize society's responsibility to protect, conserve and wisely use soil, water and related resources.

WHERE - Through the local churches

WHEN - Each year in early spring. The week is announced through the Soil and Water Conservation District in each county.

HOW -

A. Work with the local Soil and Water Conservation District office to provide Soil and Water Stewardship program inserts and messages into the church worship services in every church in the county or in individual towns.

B. Take part in a local church worship service and present a message on "why we need to constantly remind ourselves that no nation is so rich and so prosperous that they can afford to lose the basic sources needed to produce food and fiber."

C. Check with the local Soil Conservation Office for stewardship informational materials.

B. Chapter

3. **WHAT** - Recognition of Soil and Water Conservation Week

WHO - Chapter or individual project (could be a part of a BOAC Project)

WHY - As a community service to raise the consciousness of the citizens on the benefits of conservation and wise use of soil, water and other related resources.

WHERE - In news releases, program presentations, bulletin boards, and through newsletters.

WHEN - Annually observed in September. The week is announced through the Soil and Water Conservation District in each county.

HOW -

A. Work with the local and Soil and Water Conservation Disrict office to provide publicity throughout Soil and Water Conservation Week. Use brochures, news releases, posters on community bulletin boards (A poster or photo contest could be held and the winning posters and or photos could be displayed in public places).

B. Students could interview conservation farmers, soil conservation staff, or Soil and Water Conservation District Commissioners for radio spots, programs or quotes to use in newsreleases.

B. Chapter

4. **WHAT** - Recognition for Outstanding Student Conservationist

WHO - The individual student who has achieved the most in helping to carry the messages of the 1985 Food Security Act, or other worthy soil and water conservation activities.

WHY - To provide increased incentives for students to get involved in soil and water conservation activities.

WHERE - At a location as agreed to by the local Soil and Water Conservation District and the FFA chapter.

WHEN - At a time as agreed to by the local Soil and Water Conservation District and the FFA chapter.

HOW - Meet with the local Soil and Water Conservation District Commissioners to develop a recognition program.

The outstanding student or FFA member participant in Food Security Act activities or other worthy soil and water conservation activities could be recognized at either the District or FFA Banquets or a joint banquet co-sponsored by both.

B. Chapter

5. **WHAT** - Recognition of outstanding Soil and Water Conservation Youth Boards

WHO - Students who participate on youth boards, sponsored by the National Association of Soil Conservation Districts (NACD) and their Auxiliary.

WHY - To stimulate more interest in developing a youth board to assist local Soil and Water Conservation Districts carry out their responsibilities.

WHERE - Recognition is made annually at the National Association of Conservation District's Convention.

WHEN - The convention is held in February of each year.

HOW - Contact the local Soil and Water Conservation District to investigate the potential of establishing a youth board and to get more details on the contest. (This activity may fit into the BOAC program).

A national contest is annually conducted by NACD and the NACD Auxiliary to recognize outstanding youth boards and to encourage soil conservation districts to involve youth in soil conservation programs. The national award consists of $500 and a certificate, which is presented at the NACD national convention. State winners receive a certificate from NACD.

Instructions are mailed to soil conservation districts with known active youth boards from the Department of Soil Conservation. The entries are due to the Division of Soil Conservation, Department of Agriculture and Land Stewardship on June 1. State judging is completed by August 1 and sent for national judging.

FFA ACTIVITIES, CONTESTS AND AWARDS

C. Local

1. **WHAT** - Clayton County Soil and Water Conservation District Contests

    a. Soil Judging Contest
    b. Contour Layout Contest
    c. Woodland/Groundwater Quality Management Clinic

    WHY - To stimulate interest in natural resource activities.

    WHERE - Clayton County, Northeast Iowa (Fayette Soils)

    WHEN - Each Fall

    HOW - See attached sheets for details

CLAYTON COUNTY SOIL & WATER CONSERVATION DISTRICT
ELKADER, IOWA

Sept. 1, 1987

Dear Vo-Ag Instructor:

Our Clayton County Soil & Water Conservation District is once again sponsoring a Soil Judging and Contour Layout Contest for all FFA Chapters in Clayton County.

The contest rules, dates, prizes, etc. are as follows:

Date: Sept. 24, 1987 - meet from 9:00 A.M. to 2:30 P.M.

Place Clayton County Conservation Farm - Motor Mill Site.
Located in section 6 of Read Twp. WATCH FOR SIGNS.
If bringing buses please use the entrance marked with the blue marker.
SEE ATTACHED MAP.

Events Planned: 1.) Soil Judging Contest
2.) Contour Layout Contest
3.) Woodland / Groundwater Quality Management Clinic

Number of participants from each Chapter: Not limited to any specific number.

Prizes: Three cash prizes given to winners in each contest with amounts shown on the rules set up for each contest.

A traveling trophy "The John Davis Memorial-Clayton SWCD Team Soil Judging Contest Winner" to be awarded for one year to the winning soil judging team each year. The trophy then would go permanently to the school winning the contest 3 years.

A traveling trophy-plaque will be awarded to the team winning the Contour Layout Contest. (Donated by the Valley FFA.)

Plaques, provided by the Bernard Hanson Memorial Fund, will be awarded to individual winners in the soil judging and contour layout contests.

Please send in your entry card by September 13, 1987 (our response from contributors has been good so we will not have an entry fee this year). We hope your Chapter will participate in one, two or three events. If you have any questions, please contact our SWCD office in Elkader. (245-1048)

Dave Gibney
Dave Gibney, District Conservationist
Elkader, Iowa

Mark W. Bowman
Mark W. Bowman, Chairman
Clayton County SWCD

SOIL JUDGING CONTEST

WHAT: Clayton County Soil Judging Contest - For FFA Students

WHEN: Thursday, September 24, 1987 - 9:00 A.M. to 2:30 P.M.
(first judging team will start at 9:30 A.M.)

WHERE: Clayton County Conservation Farm - Motor Mill Site.
Located in section 6 of Read Twp. WATCH FOR SIGNS. SEE ATTACHED MAP.
If bringing buses please use the entrance marked with the blue marker.

PRIZES: "Team" - 1st, 2nd & 3rd - $15.00, $10.00 & $5.00
"Individual" - 1st, 2nd & 3rd - $7.50, $5.00 & $2.50
"Traveling Trophy" - 1st Place Team Winner
"Plaque" - 1st Place Individual Winner

1. a) One "School Team" will consist of four (4) individuals from that school to be named before judging starts. Only one "team" per chapter.
   b) All students will compete for "Individual" score with no limit on the number of entrants from each Chapter.
2. A ten question objective test will also be given based on "Soil Judging in Iowa" - (available from Extension Service, Elkader, Iowa 52043)
3. Judging time for each soil will be 12 minutes.
4. There will be three (3) sites to judge.
5. Soil Conservation District Commissioners will assist in scoring.
6. No entry fee in 1987. Entry cards due by Sept. 13, 1987 and are to be sent to the Clayton County SWCD Office, 117 Gunder Rd., N.E., Elkader, IA 52043.
7. Bring your own lunch.
8. Public is invited to attend.

EQUIPMENT NEEDED: An instrument to determine slope of soil, (Abney hand level is suggested.)

CONTOUR LAYOUT CONTEST

WHAT:	Clayton County Contour Layout Contest for FFA Students
WHEN:	Thursday, September 24, 1987 - 9:00 A.M. to 2:30 P.M. (first survey teams will start at 9:30 A.M.)
WHERE:	Clayton County Conservation Farm - Motor Mill Site Located in section 6 of Read Twp. WATCH FOR SIGNS. SEE ATTACHED MAP. If bringing buses please use the entrance marked with the blue marker.
PRIZES:	"Team" - 1st, 2nd & 3rd - $7.50, $5.00 & $2.50 Rotating plaque to be awarded - 1st place team

1.) One "Team" will consist of three members. An instrument man, a target man (helper), and a flagman will make up the team.

2.) Each Chapter is limited to three "Teams".

3.) The contest will include:

(a) laying out a level contour line approximately 800 feet distance from the known elevation point (starting point) to an unknown point in the field. The team will start from the known point and set flags at eight -one-hundred foot (+ or -) intervals as close to level as possible using a hand level. Judges will check from the known point to the last flag using a surveying instrument to find the "true level" to determine points earned. Closest team to "true level" will be awarded 30 points, with the next closest receiving 29, etc.. The tree man team will participate. There will be a 15 minute maximum time limit. Equipment is hand level. Flags will be furnished. One try only.

(b) distance pacing between two points approximately 1,000 feet distance (actual distance between these two-points will be known by judges who will have measured the distance with a measuring steel tape). The flagman of the team will do the pacing. Closest team to the actual footage will be awarded 30 points with the next closest receiving 29, etc.. No special equipment is needed. One try only. There will be a 15 minute time limit.

4.) Soil Conservation Service Technicians will assist in scoring.

5.) No entry fee in 1987. Chapter's decision to enter the contest is to be sent to the Clayton County SWCD Office, 117 Gunder Road, N.E., Elkader, IA 52043, by September 13, 1987.

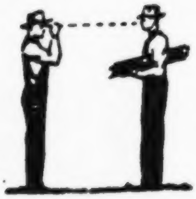
6.) Bring your own lunch.

7.) Public is invited to attend.

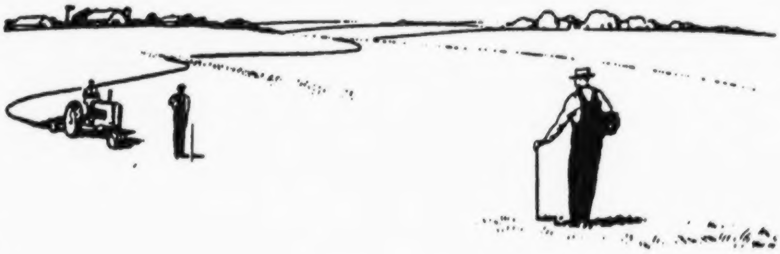
EQUIPMENT NEEDED: None. (You may bring your own hand level for the contour layout contest.)

CONTOURING

CONTEST

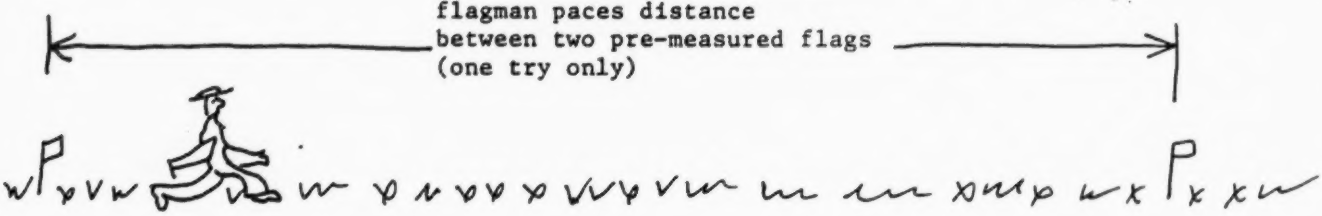


First stand on land level with helper or targetman and use hand level to determine which part of his hat, face or shoulder is level with your eyes. This is your "target."



1. Start from known or starting point in the proposed contour line. Take position with hand level at this stake or flag.
2. Helper walks in direction of line about 100 feet and faces you. Signal helper to move up or down hill until hand level shows he is on the contour. Helper now drives stake or sets marking flag.
3. Move up to the new stake while helper walks farther along the line. Repeat this process until the line is staked out, approximately 800' from starting (known) point.
4. After contour line is established, judges will survey and determine difference from "true contour" with a surveying instrument by reading from the starting point to the last-flag set.

DISTANCE PACING CONTEST



flagman paces distance between two pre-measured flags (one try only)

He then multiplies the number of steps taken by his "pace factor"* to determine distance in feet. He turns this distance to the judges, who determine difference from actual distance measured with a steel tape.

*See next page on how to determine "pace factor".

MEASUREMENT OF HORIZONTAL DISTANCES

Pacing, chaining, and stadia are used for measuring horizontal distances.

PACING

Pacing may be used for approximate measurement when an error as large as 2 feet per hundred feet is permissible. Measurement by pacing consists of counting the number of steps between two points and multiplying the number by a predetermined "pace factor". Pace factors will vary between individuals. Each person should determine his individual pace factor while walking his natural stride.

Actually, the pace factor for each individual is the average distance in feet per step. It can be determined best by pacing a measured distance (usually 500 feet) several times. It should be paced enough times to make certain the number of paces for the distance does not vary over 2 or 3. The "pace factor" then would be the distance in feet divided by the number of paces. The "pace factor" may vary with the roughness and slope of the ground. Adjustments should be made to take care of these variations.

Some people prefer to use a stride in place of a pace. It consists of 2 paces, so the "stride factor" would be two times the "pace factor".

Measurements by pacing for terrace and diversion layouts, preliminary profile work, and gridding for surface drainage survey's generally are permissible.

FOREST MANAGEMENT SESSION

WHAT: Forest Management Learning Experience

WHEN: Thursday, September 24, 1987 - 9:00 A.M. to 2:30 P.M.
(first discussion will start at 9:30 A.M.)

WHERE: Clayton County Conservation Farm - Motor Mill Site
Located in section 6 of Read Twp. WATCH FOR SIGNS. SEE ATTACHED MAP.
If bringing buses please use the entrance marked with the blue marker.

This will be a lecture and discussion type learning experience covering basic timber management such as selective cutting, pruning and planting and applying these principles to a woodland plot on this farm as this discussion will take place in the woods where the students can participate and observe actual woodland situations.

Length of each session will be 30 to 40 minutes for each Chapter participating.

Bring your own lunch.

THE BERNARD HANSON "WINDING ACRES AWARD PLAQUE"

The Bernard Hanson, Winding Acres Award Plaque, to be presented annually by the Clayton County Soil Conservation District, is provided from a fund established by the family of Bernard Hanson, longtime dedicated Soil Conservation District Commissioner. There will be two plaques presented annually at the Clayton County Soil Conservation Awards Banquet. One plaque will be presented to the first place FFA soil judge in the County FFA Soil Judging Contest. One plaque will be presented to the highest scoring individual in the Contour Line Contest.

GENERAL RULES:

1. An individual may not receive the plaque more than once.
2. An individual may not receive both plaques the same year.
3. The winner must be enrolled in the Vo-Ag, FFA Program at a school within, or serving a portion of, the Clayton County Soil Conservation District.
4. The winner of the award plaque will qualify for other awards offered at the Annual FFA Soil Judging Soil Judging Contest.
5. Soil Judging Plaque winner will be determined by the individual's scores of the written test. To break a tie, the following sequence will be used:
    a. Add pacing score of the individual.
    b. Subtract a predetermined pit score.
6. Contour Contest Winner will be selected by combining the individual contour score with the individual pacing score. To break a tie, the following sequence will be used:
    a. Add combined score from individual's total judging score of all soil pits.
    b. Add score of individual written test.
7. For breaking a tie, tie breaking sequence will be followed only to point at which the tie is first broken.

TEAM SCHOLARSHIP AVAILABLE

The Clayton County Soil Conservation District has a $100.00 scholarship available to a FFA Soil Judging team that qualifies for the National Soil Judging Contest in Oklahoma. This support scholarship is made available from a fund provided by the family of Bernard Hanson, longtime dedicated Clayton County Soil Conservation Commissioner.

The support scholarship will be available to a VO-AG FFA Soil Judging team from a school within, or serving a portion of the Clayton County Soil Conservation District. The team must be certified as elgible by the Iowa FFA Advisor (DPI Consultant). All team members must have participated in the Clayton County Soil Judging Contest, within the last three seasons. All members of the team must still be attending high school and enrolled in the school VO-AG program.

Application for this support scholarship will be made at the office of the Clayton County Soil Conservation District.

FFA ACTIVITIES, CONTESTS AND AWARDS

C. Local

2. **WHAT** - Humboldt FFA and Humboldt County Soil and Water Conservation District Awards Banquet

   WHO - The FFA chapter and the district have a joint banquet to provide recognition to FFA members and outstanding conservationists.

   WHY - To provide visibility to FFA and soil and water conservation with strong ties to both programs.

   WHERE - Humboldt High School

   WHEN - In early spring of each year

   HOW - See attached program, page 3-4.91. Cash awards are given to the essay winners in the Soil Conservation Essay Contest.

HUMBOLDT FFA

AWARDS BANQUET

6:30 P.M. - MARCH 28, 1988

Opening Ceremonies	Officers
Secretary's Report	Tom Hundertmark
Treasurer's Report	Seth Naeve
Invocation	Kelly Gordon
Dinner	Humboldt County Pork Producers and High School Kitchen Staff
Welcome	Tina Smith
F.F.A. Creed	Justin Krebs

AWARDS

Leadership	Miles Nostrom
Scholarship	Tom Johnson
Agricultural Proficiency Awards	Seth Naeve
Star Greenhand	Corie Erickson
Star Chapter Farmer & Chapter Agribusinessman	Tom Hundertmark
Appreciation Certificates	Mike Piercy
Dekalb Achievement Award	Dekalb Representative
Contest Results	John Kollmorgan
State FFA Officer	Brad Lehmann
Outstanding Conservation Farmers Mr. & Mrs. Robert Adams Mr. & Mrs. Gary R. Adams	Marvin Lindemann
Izaak Walton Windbreak Award Mr. & Mrs. Russell C. Nelson	Marvin Lindemann
Soil Essay Contest Winners Sponsored by: Humboldt Mutual Insurance Association and Humboldt Soil & Water Conservation District	Lawrence Marty
Sr. Division	1st - Tom Hundertmark 2nd - Tammie Ashley 3rd - Kelly Gordon
Jr. Division	1st - Andy Jenkins 2nd - Amy Biedeimann 3rd - Renee Wickett

Installation of New Officers	Old, New Officers
Slide Presentation	Humboldt FFA
Closing Ceremonies	New Officers

Clean Up Crew - FRESHMEN

HUMBOLDT SOIL CONSERVATION DISTRICT COMMISSIONERS

CHAIRMAN: Marvin Lindemann	Humboldt
VICE CHAIRMAN: David Marty	LuVerne
TREASURER: Dale Reedy	Hardy
Max Redinius	Bradgate
David Fevold	Humboldt
ASSISTANT COMMISSIONER: Tom Johnson	Humboldt

FFA ACTIVITIES, CONTESTS AND AWARDS

C. Local

3. **WHAT** - Food Security Act - Telephone Survey and Public Meeting

WHY - To assist in implementing the 1985 Farm Bill

WHERE - Sioux County (Sioux Center Vocational Agriculture Department)

WHEN - March 1988

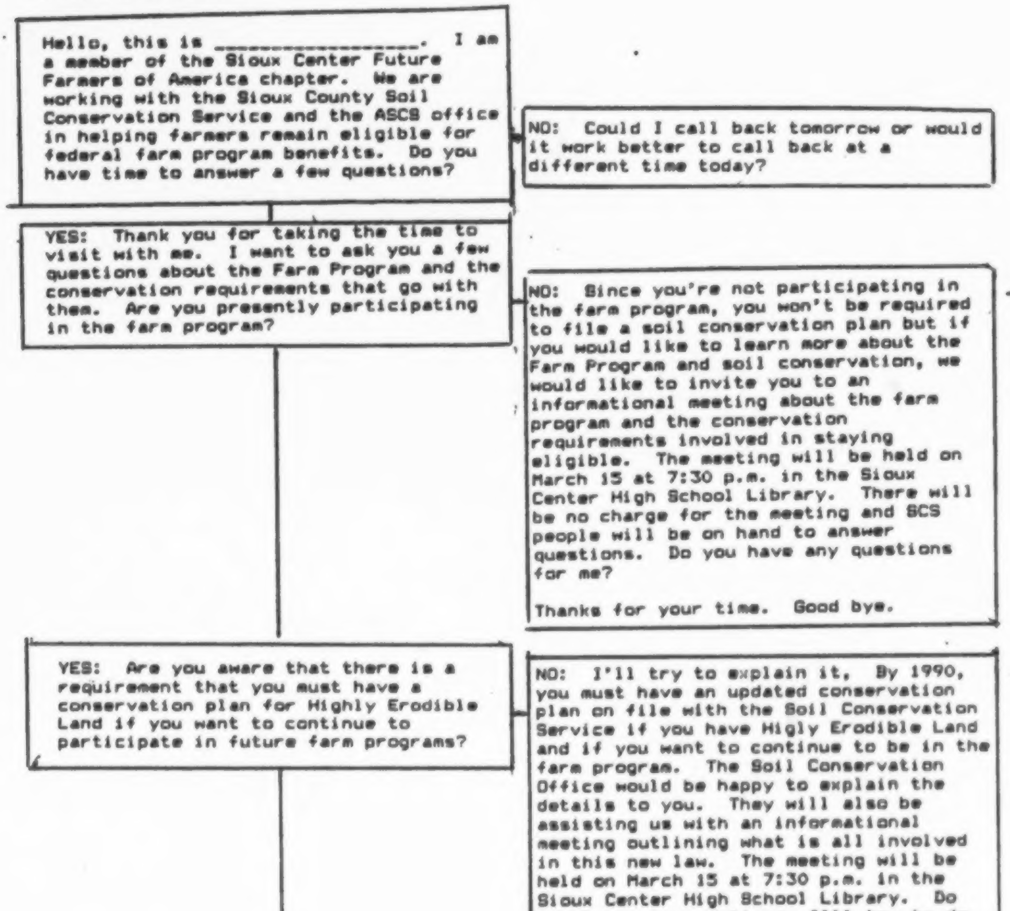
HOW - See attached flow chart, page 3-4.93, for details of the telephone survey; and the letter and agenda for the public meeting, page 3-4.94. The Vocational Agriculture Department worked closely with the District Conservationist at the SCS office for program planning and implementation.

Flow Chart for SCS Survey Sioux Center Voc Ag Telephone Survey

Hello, this is Shaun Sandbulte
could I speak with ____________________?

NO: Could I call back later tonight or would tomorrow be more convenient?

When you get the farmer on the line.
Then proceed with:



Hello, this is ____________________. I am a member of the Sioux Center Future Farmers of America chapter. We are working with the Sioux County Soil Conservation Service and the ASCS office in helping farmers remain eligible for federal farm program benefits. Do you have time to answer a few questions?

NO: Could I call back tomorrow or would it work better to call back at a different time today?

YES: Thank you for taking the time to visit with me. I want to ask you a few questions about the Farm Program and the conservation requirements that go with them. Are you presently participating in the farm program?

NO: Since you're not participating in the farm program, you won't be required to file a soil conservation plan but if you would like to learn more about the Farm Program and soil conservation, we would like to invite you to an informational meeting about the farm program and the conservation requirements involved in staying eligible. The meeting will be held on March 15 at 7:30 p.m. in the Sioux Center High School Library. There will be no charge for the meeting and SCS people will be on hand to answer questions. Do you have any questions for me?

Thanks for your time. Good bye.

YES: Are you aware that there is a requirement that you must have a conservation plan for Highly Erodible Land if you want to continue to participate in future farm programs?

NO: I'll try to explain it. By 1990, you must have an updated conservation plan on file with the Soil Conservation Service if you have Higly Erodible Land and if you want to continue to be in the farm program. The Soil Conservation Office would be happy to explain the details to you. They will also be assisting us with an informational meeting outlining what is all involved in this new law. The meeting will be held on March 15 at 7:30 p.m. in the Sioux Center High School Library. Do you have any questions, I'll try to do my best to explain what the meeting will be like?

Thanks for your time. Good Bye.

YES: Good. Have you started or do you plan to make an appointment with the Soil Conservation Service?

NO: If you don't intend to have a plan, which response best tells why?

a. I don't plan to be in the program.

b. I won't be farming anymore.

c. The farm program benefits won't pay for the extra cost of soil conservation

Whatever your reason, if you would still like to learn more about the farm program, and the conservation requirements associated with it, we will be having an informational meeting to outline the details of this new law, and to allow you to explore all of your options. The meeting will be held on March 15 at 7:30 p.m. in the Sioux Center High School Library. There will be no charge for the meeting and SCS people will be on hand to answer questions. Do you have any questions for me?

Thanks for your time! Good Bye.

YES: Thats good. I would encourage you to get started as soon as possible to avoid the last minute rush. If you would like to explore what some of your options might be on your highly erodible land, we will be having an informational meeting to outline the details of this new law, and to allow you to explore all of your options. The meeting will be held on March 15 at 7:30 p.m. in the Sioux Center High School Library. There will be no charge for the meeting and SCS people will be on hand to answer questions. Do you have any questions for me?

Thanks for your time and I hope to see you at the meeting. Good Bye.

United States Department of Agriculture
Soil Conservation Service
112 FIRST STREET S. E.
ORANGE CITY IA 51041
712/737-2253

03/08/87

As a result of your application for program benefits from a USDA agency, our Soil Conservation Service (SCS) staff has completed a soils inventory on your farm. This evaluation has shown that field(s) are designated as highly erodible fields. This is a second notice which includes the official SCS-CPA-026 that lists the tracts and fields of concern.

Under the conservation compliance provision of the 1985 Food Security Act, this means that you must have a conservation plan developed on these fields by December 31, 1989, and all practices applied by December 31, 1994, or you are no longer eligile for USDA benfits. These benefits include:

__USDA price and income support payments from ASCS
__Disaster payments
__Crop insurance
__FmHA administration loans
__Commodity Credit Corporation (CCC) storage loans
__Farm storage facility loans
__other programs with the USDA

Conservation plans will be developed for any producer requesting assistance. To assist you with developing your plans, a general information and planning meeting has been set up. If you rent land, please inform your landlord as he will play an important part in any plans made. This meeting will be different from any other. The greatest part will be run by the Sioux Center FFA students. They will assist individual producers with exploring alternatives to reduce soil loss to allowable soil loss levels on their individual farms. The agenda for the meeting is on the back of this letter. Date: Tuesday, March 15, 1988. Time: 7:30 p.m. at the Sioux Center High School Commons. If you cannot attend the meeting, please call the SCS office at 737-2253 and set up an appointment. The enclosed appointment card may also be used to set a date.

If the attached SCS-CPA-026 form indicates that you have a hydric soil on your farm, you may have wetlands. A wetland determination will be required if the landuser physically changes the wetland by installing, maintaining, or altering the drainage of a wet area. If you want a determination, request the SCS in writing by identifying the farm, tract and field number. If you have an existing conservation plan, that PLAN will still need to be updated for the tract and field indicated on the CPA-026 form.

Sincerly,

David R. Speidel
District Conservationist

DRS/mjn

Enc: SCS-CPA-26 and Appointment Card

Section IV.

Soil Erosion

↕

Soil Productivity Connection

INSTRUCTIONAL MODULE

THE CONNECTION BETWEEN SOIL EROSION AND SOIL PRODUCTIVITY

INTRODUCTION

This instructional module entitled "The Connection Between Soil Erosion and Soil Productivity" is complete with all the materials and references needed. It includes six lessons developed in sequence from Lesson 1, "Understanding the Importance of the Soils Resource" to Lesson 6, "'Off-Site' Costs of Erosion (Erosion Consequences on the Neighbor)."

Each of the six instructional plans includes (1) participant objectives, (2) materials and references, (3) visual masters using VM designation, (4) activities using ACT designation, (5) careers associated with each topic area, (6) an interest approach, (7) a list of teaching procedures, (8) a summary or a conclusion of the lesson topics, and (9) other activities that may be selected by the instructor.

The module was developed by Eldon Weber, U.S. Soil Conservation Service, as a part of the Iowa State University Agricultural Education Department and U.S.D.A. Soil Conservation Service Partnership, May 1988.

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LESSON ONE

IMPORTANCE OF SOIL AS A RESOURCE

LESSON 1

LESSON: Understanding the Importance of the Soils Resources

OBJECTIVES:

After completion of this lesson, participants wil be able to:

1. Describe how land (soil) contributes to our quality of life.
2. Identify historical events in the United States related to soil resource problems.
3. Identify careers associated with this lesson.

'a handful of individuals have always taken care of the resources at their feet– not always because it was fashionable but because it was right"

MATERIALS AND REFERENCES:

Editorial, Albia, Iowa, Union Republican Newspaper, "Words to Think On"

Overhead Projector

VISUAL MASTERS:

VM-LAND-1, Pledge
VM-LAND-2, Quote, Nigerian Chieftain
VM-LAND-3, Land Abuse

ACTIVITIES:

ACT-LAND-1, Iowland
KEY ACT-LAND-1, Iowland
ACT-LAND-2, "A Historical Overview"
U.S. Soil Conservation Service
USDA 1988 Year Book "Our American Land"
ACT-LAND-3, Editorial Quote from Albia Republican
ACT-LAND-4, Soil Resource
KEY ACT-LAND-4, Soil Resource

Developed by Eldon Weber, May 1988

ASSOCIATED CAREERS:

Farmer
Land Use Planner
Soil Conservationist
Soil Scientist
Agronomist
Policymakers

INTEREST APPROACH:

Often forgotten in the race for higher yields per acre are the underlying basics of soil science. This unit deals with the science of a vital ingredient, land or (soil) as the foundation of life.

Use **VM-LAND-1** to generate a discussion on natural resource values. **What does this pledge mean to you?** Use **VM-LAND-2** to ask the question, **How does this quote relate to our generation?**

Demonstration: (To illustrate what a small percentage of the earth's surface is made up of production soil.)

1. Cut an apple in four equal parts, three parts represent the oceans of the world. The fourth part represents land.
2. Cut the land (one-fourth) in half - one-eighth. One represents deserts, mountains, swamps, and arctic. The other one-eighth represents land where people can live but may not grow food.
3. Slice this one-eighth section crosswise into four equal parts. Three of these one-thirty-seconds sections represent areas of the world which are too rocky, too wet, too hot, or where soils are too poor for production, as well as areas developed by people.
4. Peel the last one-thirty-second section. This small bit of peeling represents the soil of our earth on which mankind depends for food production. It is the responsibility of each generation to use the soil wisely to provide for future generations as only seven percent of the earth's land surface is suitable for agriculture.

Most people don't take time to reflect on what a quality life means. **"What does a quality life mean to you and does land or** soil play a part?" Social, spiritual, and family values are important in a quality life, but what about soil resources?

TEACHING PROCEDURE (allow 50 minutes):

1. Divide into groups to address the above question. Hand out **ACT-LAND-1** to groups. After 15 minutes of group discussion, ask for a report from each group leader. Use **Key-ACT-LAND-1** in discussing the reports. Conclude: the quality of life in the long run depends on how we use, protect and develop our soil resource. This activity was designed to stimulate your thinking and raise your level of appreciation for the value of soil as it relates to our quality of life.

2. Use **VM-LAND-3.** Ask these questions, **"Is this natural erosion or is it caused by people?** Why? Answer - Caused by people as you can see the row pattern.

3. Write the following questions on the chalk board:

    1. **Do you know any key historical events that helped shape our understanding and beliefs about the land? For instance, what is the meaning of dust bowl days?**

    2. **Does the average person believe there is a need to care for our land?**

    3. **How would you describe your belief about the land?** Talk about differences of perceiving land as a soil resource as opposed misplaced soil as dirt.

    Briefly discuss the answers to these questions, then direct the participants to read **ACT-LAND-2** seeking more specific answers to the questions. Ask participants to again answer the above questions.

4. Read aloud **ACT-LAND-3**, then lead a discussion getting a consensus to answer the following questions:

    Where would you place yourself on the scale (show on the chalk board) for these questions?

Disagree	Somewhat Disagree	Undecided	Somewhat Agree	Agree

    1. **Is there a way to use the land for the production of food and fiber, allowing successful farming and still**

protect the resources for our children and grandchildren?

2. **Is soil conservation strictly a financial issue?**

3. **The effects of erosion can be as devastating as war.**

4. **I can make an impact on saving soil.**

5. Write the following question on the chalkboard, "What **careers would be associated with the topics that we have been discussing and how is each associated?** List answers on the chalk board.

   Answer:

   Soil Conservationist: Specialist in soil and water management.

   Land Use Planner: Helps communities plan developments based on soil capabilities.

   Soil Scientist: Classifies and maps land based on soil properties, capabilities, and limitations.

   Agronomist: Specialist in soils and plants.

   Policymaker: Makes decisions that impact the use and treatment of land.

   Farmer: Produces food and fiber.

6. Hand out **ACT-LAND-4** and ask that it be completed as a review for this lesson.

7. In conclusion, we have determined:

   1. How land (soil) contributes to our quality of life.

   2. Reviewed the key historical events related to the soil resource problems.

   3. The kinds of careers that are related to the topic of land (soil) resource.

PLEDGE

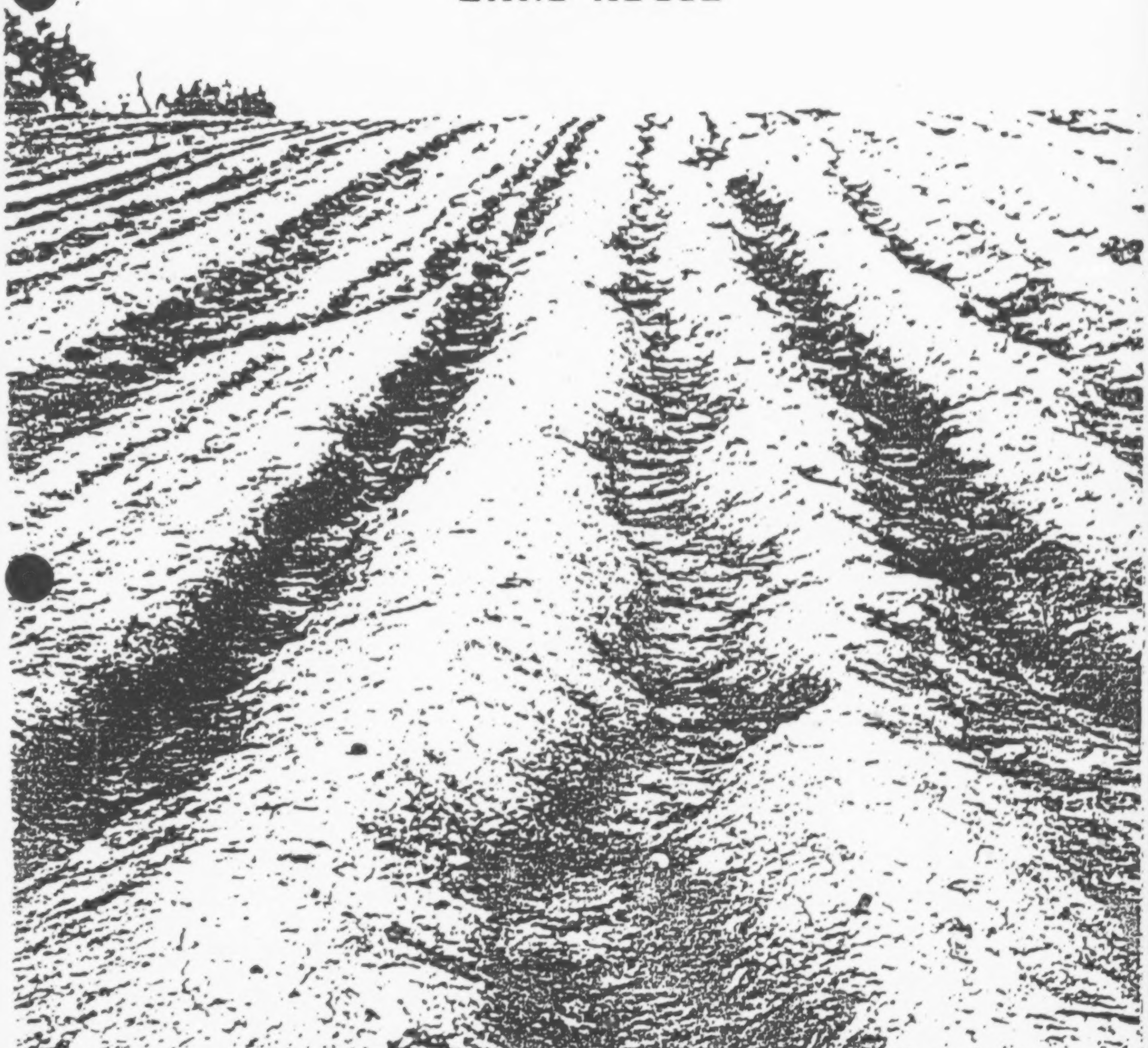
I give my pledge as an American to save and faithfully to defend from waste the natural resources of my country---its soil and minerals, its forests, waters, and wildlife.

WHAT DOES THIS PLEDGE
MEAN TO YOU?

"I CONCEIVE THAT LAND
BELONGS TO A VAST
FAMILY
OF WHICH MANY ARE DEAD
FEW ARE LIVING
AND COUNTLESS NUMBERS
ARE UNBORN."

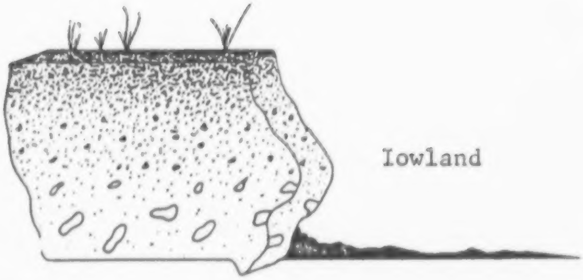
NIGERIAN CHIEFTAIN

LAND ABUSE



IOWLAND

GROUP TASKS:



1. Select a group leader to lead discussion and a recorder to take notes.

2. Situation:

You and a few other key leaders have been sent to an island called "Iowland" to develop a land use plan. This can be likened to when our ancestors came to America. This country was inhabited by American Indians. "Iowland" is inhabited, but the island has not developed agriculturally. Your assignment is to decide how the land on "Iowland Island" (approximately 36 million acres) can best be used to provide for a quality life for the inhabitants and future citizens of the island. The climate and land of Iowland is similar to Iowa as it existed in 1700. This island's land is made up of a variation of soils as follows:

(1) 12 million acres of good productive soil covered with prairie grass.

(2) 14 million acres of soil, relatively productive, but with steeper slopes covered with scattered trees and grass.

(3) .5 million acres of wetland, scattered throughout the northcentral part of the island, covered with wetland plants.

(4) 10 million acres, which is not very productive because of steep slopes or shallow topsoil over bedrock or a rocky surface, covered with trees.

As group, answer the following:

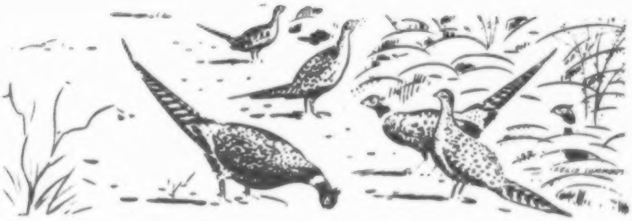
a. **Should all the soils on the island be used for crop land, and if not, why not?**

b. **What are your general recommendations to the citizens of Iowland on how the land should be managed to provide for quality life for present and future generations?**

Consider the following needs normally associated with quality of life: food, energy, shelter, transportation and wildlife.

3. The group leader should be prepared to report on the group's plan.

Enc: SCS-CPA-26 and Appointment Card



KEY ACT-LAND-1

IOWLAND

A. **Should all the soils on the island be used for crop land and if not, why?**

At a minimum, answers should include the following:

No. It is obvious that not all soils are suited for crop land. Soils on steep land and wetlands should not be used for crop land. Soils that are shallow to bedrock should not be used for cropland.

Why:? Soils on steepland are too erosive when used as crop land contributing to soil deterioration. Soils on wetland will be too difficult to farm. Soils that are shallow to bedrock, if allowed to erode, will become unproductive for any useful purpose.

B. **What are your general recommendations to the citizens of Iowland on how the land should be managed to provide for a quality life for present and future generations?**

At a minimum, answers should include the following:

Soils that are not found on wetlands and steeplands can be farmed using conservation systems to prevent soil erosion and water pollution.

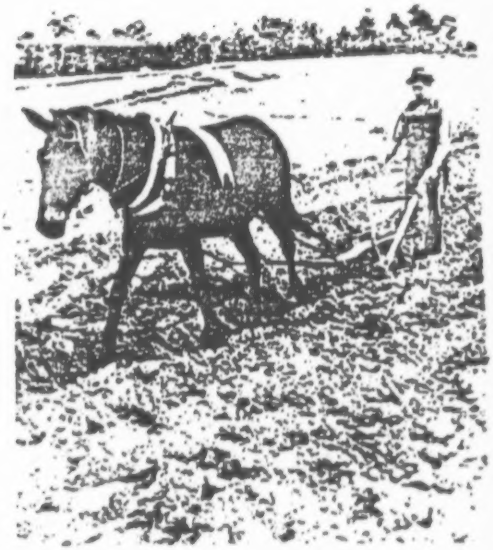
Soils that are found on steeplands should be left in grass and trees and plans developed to properly manage grass and trees for food, upland wildlife, and fiber production.

Soils found on wetland should be protected and developed for water wildlife.

With this type of good land management we can enjoy good food, land and water types of recreation, and a scenic environment.

Develop a good discussion on the benefits of good land use in using and treating soil within its capability for a sustained quality of life for present and future generations.

A HISTORICAL OVERVIEW



The following quotes from the 1988 USDA Yearbook, Our American Land.

Views of early leaders:

Quote by Patrick Henry: **"Since the achievement of our independence, he is the greatest patriot who stops gullies."**

Quote by Thomas Jefferson: **"Those who labor in the earth are the chosen people of God"** and **"in point of beauty, nothing can exceed that of the waving lines and rows winding along the face of hills and valleys."** He was influenced by his son-in-law, Thomas Randolph, who perceived contour plowing.

Thoughtful citizens have continually tried to insert the issue of soil conservation ethics into American agriculture debate. In 1768, George Washington is quoted **"The general custom has been, first to raise a crop of Indian corn . . . then a crop of wheat . . . and so on, alternately without any dressing, until the land is exhausted, when it is turned out, without being sown to grass seeds or any other method taken to restore it; and another piece is ruined in the same manner. No more cattle are raised then can be supported by lowland meadows and swamps . . . our lands were originally very good; but use and abuse have made them quite otherwise.**

(The following information was obtained from the U.S. Soil Conservation Service.)

Grass and legumes have long been recognized as the premier maintainer of the soil natural "glue" which prevents wind and water erosion. Heavy tillage, combined with bare soil during fallow seasons, has left much of the country's crop land deficient in organic matter.

When the first European settlers arrived on the east coast of North America, they saw limitless resources. In most areas they had to cut down the forests before they could till the soil. In time, the forests were cleared and the new crop land was farmed. With year after year of cultivation, many fields became infertile and gullied. Farmers began to abandon the land to move farther west, across the mountains and into the midwestern prairies. Homesteaders continued to move the frontier westward into the Great Plains and on to the west coast. Many farmers thought erosion was inevitable. Some farmers even took pride in their ability to "wear out" the land.

By the early 1900's, little new farmland was left to open up. Erosion rates increased again when farmers plowed poor land during World War I to take advantage of high farm prices. Ironically, the farm depression that followed the war forced many to continue farming poor lands just to make a living. The stock market crash of October 1919 and the ensuing Great Depression forced many farmers off the land. And as if that weren't misery enough, a severe drought overran the Great Plains.

Strong winds carried clouds of dust from the plains to the Atlantic Ocean--a distance of nearly 2,000 miles. Prior to the worst dust storms, there was the right man at the right place to father a nation-wide conservation movement. Hugh Hamond Bennett, founder and head of the Soil Erosion Service in 1933 and the Soil Conservation Service in 1935 was one of the greatest evangelists for the soil conservation movement. He was described as an evangelist, man of action, dynamic, eloquent, scientist, and flamboyant. He was educated as a soil scientist.

On May 11, 1934, the first great dust storm moved from the Great Plains out over Washington, D.C. and into the Atlantic Ocean. Bennett used this event to point out what was happening with the resources throughout the United States. The next great dust storm occurred March 6, 1935. As head of the Soil Erosion Service he had his employees track the storm as it moved across the United States. He told key congressmen that there would be red dust sifting across their desks at a certain time. This happened precisely as he had told them making quite an impression. He got their attention concerning a need to protect soil resources from wind erosion.

He also got Congress's attention on the destructive forces of water on unprotected soil. In order to dramatize his point, he threw a bucket of water across a conference table where they were having a congressional committee meting. Of course, the water went across papers, off onto the floor, and at this point he said, "This is what is happening with our unprotected land (runoff and erosion)." He then placed a carpet on the table and threw more water on the carpet. He made the analogy that the carpet absorbs water like the cover that is needed across America to protect our resources. He was successful in influencing Congress to finance and develop a soil conservation program.

In Iowa we have lost half of our top soil in the last 100 years. With present trends of erosion of our crop land, many soils in Iowa will lose their economic productivity in the next 100 years. Iowa is notoriously known for the greatest number of total tons of soil loss per year (240 million tons). This is enough soil to fill a convoy of 10-ton dump trucks that would circle the earth 3.6 times. On the average, that is 9.4 tons per acre per year, equivalent to one-sixteenth of an inch of top soil on all crop land acres. Soil loss on unprotected soil can range up to over 50 tons per acre per year.

Soil is not a renewable resource like plants or trees. It takes hundreds of years to replace lost top soil.

It's the top layer of soil (topsoil), the top six to eight inches of rich, dark soil which is the foundation of Iowa's economy and the basis of your way of life.

Albia Union- Republican
Thursday- March 22, 1984

D.S.C.
MAR 27 1984

Editorial

Words to think on

The Soil Conservation awards banquet was held Monday during an appropriate time. Appropriate because this is the week when all of agriculture is honored and soil conservation work is the key to maintaining agriculture's importance to the world.

One of the speakers at the banquet was Iowa Department of Soil Conservation field representative Ken Bruene. What he said had significance for farmers, conservationists; everyone really.

He said he was glad to see so many children involved in the poster contest because their generation may be the last generation able to solve the problem of soil and natural resource losses.

He said he was glad to see the banquet held in a church because he believed soil conservation was more than dollars and cents. He believed that soil nservation had a spiritual side in God's call for ewardship of the land.

He said he realized farmers faced economic problems but that if we destroy agricultural and other natural resources to pay the bills today, we are making a huge mistake for tomorrow.

He said he had seen the damage done by war and hated it, but the same damage was being done to the land over a period of years through erosion.

And finally he said he had three grandchildren and his greatest hope was for them to have a good life with pure water, countless trees and fertile land.

Ken Bruene didn't speak more than five minutes, but what he said was enough to direct our thinking for the next hundred years.

SOIL RESOURCE

1. How does land contribute to a quality life?

2. What lessons have you learned from historical events in the past that will help shape your opinion about the management of land in the future?

3. What careers are associated with the content of this lesson?

KEY ACT-LAND-4

SOIL RESOURCE

1. **How does land contribute to a quality life?**

   Some things worthy of mentioning are:

   a. Productive, well-managed soil will provide food and fiber for present and future generations.

   b. By using good soil stewardship, the land is kept productive for agriculture use, providing a favorable environment for people, trees, crops, and wildlife.

   c. Taking good care of the land (soil) contributes to good water quality, as soil and water management are closely linked.

   d. With well-managed soil and water we can enjoy good food, land and water types of recreation in our leisure time, and a scenic environment.

   e. It's the top six inches of topsoil that is the foundation of Iowa's economy and the basis of your way of life.

2. **What lessons have we learned from the past that will help shape your opinions about land management in the future?**

   Some things worthy of mentioning are:

   a. It is important to manage the land to protect it from wind and water erosion. Soil is not a renewable resource like plants and trees as it takes hundreds of years to replace lost top soil.

   b. As we use the land we must be good stewards to use land according to the soil capability and treat it so the soil loss doesn't exceed the rate of soil formation.

3. **What careers are associated with the content of this lesson?**

   Land Use Planner
   Soil Conservationist
   Soil Scientist
   Agronomist
   Policymakers
   Farmer

LESSON
TWO

MAKE - UP
OF
SOILS

LESSON 2

LESSON: Understanding the Make Up of the Soil Resource

OBJECTIVES:

After completion of this lesson, participants will be able to:

1. Identify the major layers in the soil profile.
2. Describe soil properties.
3. Identify major soil ingredients.

MATERIALS AND REFERENCES:

Container with samples of sand, silt, and clay (clay or bentonite)

A basketball, a baseball, and a beebee.

Container with a handful of soil.

Overhead Projector

VISUAL MASTERS:

VM-SOILS-1, Pie Graph
VM-SOILS-2, Soil Profile

ACTIVITIES:

ACT-SOIL-1, Soil Structure
Key ACT-SOIL-1, Soil Structure
ACT-SOIL-2, Erosion by Water
ACT-SOIL-3, Soil Formation Structure and Texture
Key ACT-SOIL-3, Soil Formation Structure and Texture
ACT-SOIL-4, Description of Soil Profile

Developed by Eldon Weber, May 1988

ASSOCIATED CAREERS:

Soil Scientist
Soil Conservationist
Agronomist
Farmer

INTEREST APPROACH:

We have learned that soil is more than dirt.

Place demonstration soil in hand.

Demonstration: Pick up a handful of soil. Ask students, **"If this handful of soil represents the earth's surface, how much should I remove that represents oceans, rivers, and lakes?"** Answer, three-fourths (3/4). Allow three-fourths of the soil to fall into a container. **"Now of this one-fourth (1/4) left in my hand, how much represents deserts, glacial poles, and mountain peaks?"** Answer, one-half (1/2), so let one-half (1/2) of the remaining soil drop in the container. Now drop one-tenth (1/10) of what's left and say, "this is the land used for cities, towns, houses, roads, etc. What's left in your hand is all we have to support life on earth, and this soil is trickling through our fingers at an alarming rate due to unchecked erosion." Let remaining soil trickle into container.

TEACHING PROCEDURES (allow 1 hour, 30 minutes):

1. In the previous lesson we gained an appreciation for the land and soil as a vital resource in the production of food and fiber. During this lesson we are going to analyze the soil resource from a scientific point of view. We'll look for answers as to **"What makes good soil the best proven medium for plant production?"** Hold up a basketball, baseball, and a beebee. **Ask: In terms of relative size, if a basketball represents a grain of sand, what would a beebee represent? What would a baseball represent?** Answer: basketball, sand; baseball, silt; and beebee, clay. Soil scientists classify soil particles into sand, silt and clay.

2. Hand out **ACT-SOIL-1** for individualize study or group discussion.

3. Use **VM-SOILS-1** and **KEY ACT-SOIL-1** to discuss answers to **ACT-SOIL-1**.

4. Write the following questions on the chalk board for the next activity.

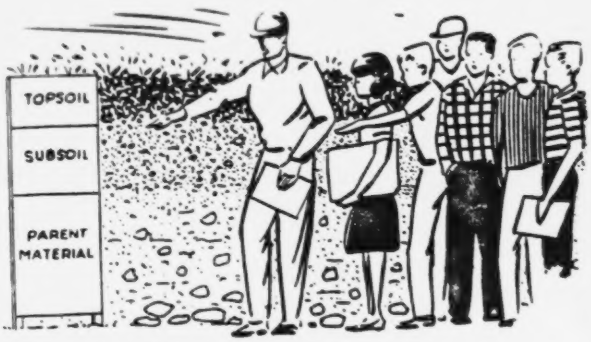
   a. What factors affect soil formation?

   b. What factors affect soil erodibility?

   c. How can the soil structure be improved?

5. Hand out **ACT-SOIL-2.** Ask individuals to read this handout and be prepared to discuss answers to the questions.

6. Use **ACT-SOILS-3** and **Key ACT-SOIL-3**, to evaluate comprehension to this point in the lesson.



7. Participants to work in groups to develop soil texture samples. Obtain sand, silt (from a flood plain area), and clay (from hobby shop or subsoil with high clay content). Assign groups different ratios of sand, silt, and clay to represent the following: (ratios shown in the following sequence clay, sand, and silt) loam 1:2:2, sandy loam 1:7:2, silt loam 2:1:7, clay loam 1:1:1, sandy clay 4:5:1, silty clay loam 3:1:5, silty clay 5:1:5. Have groups mix soil, put in a paper cup, and label cup as to soil texture.

8. Use **VM-SOIL-2** to illustrate a soil profile and reinforce important points. Handout **ACT-SOIL-4** to discuss **VM-SOIL-2.**

9. **What careers are associated with the topic or study of soils?**

   Farmer, Soil Scientist, Soil Conservationist, and Agronomist.

10. In conclusion, place the following on the chalk board and call on students for answers:

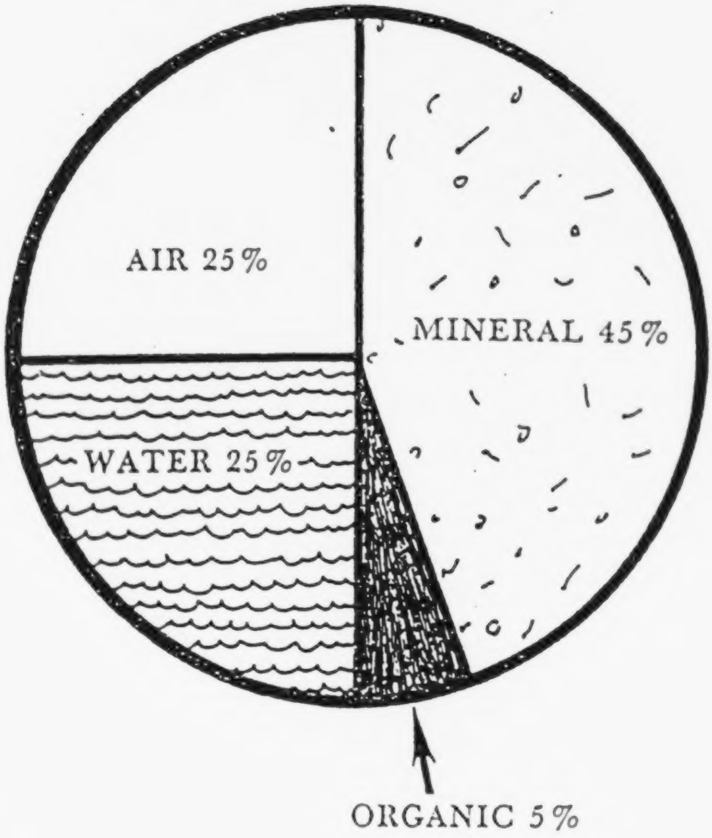
    What are the major soil layers, soil properties, and soil ingredients that contribute to ideal plant growth?

    Top soil, subsoil, plant material, ideal proportions of air, water, mineral and organic matter, and the right portion of sand, silt, and clay.

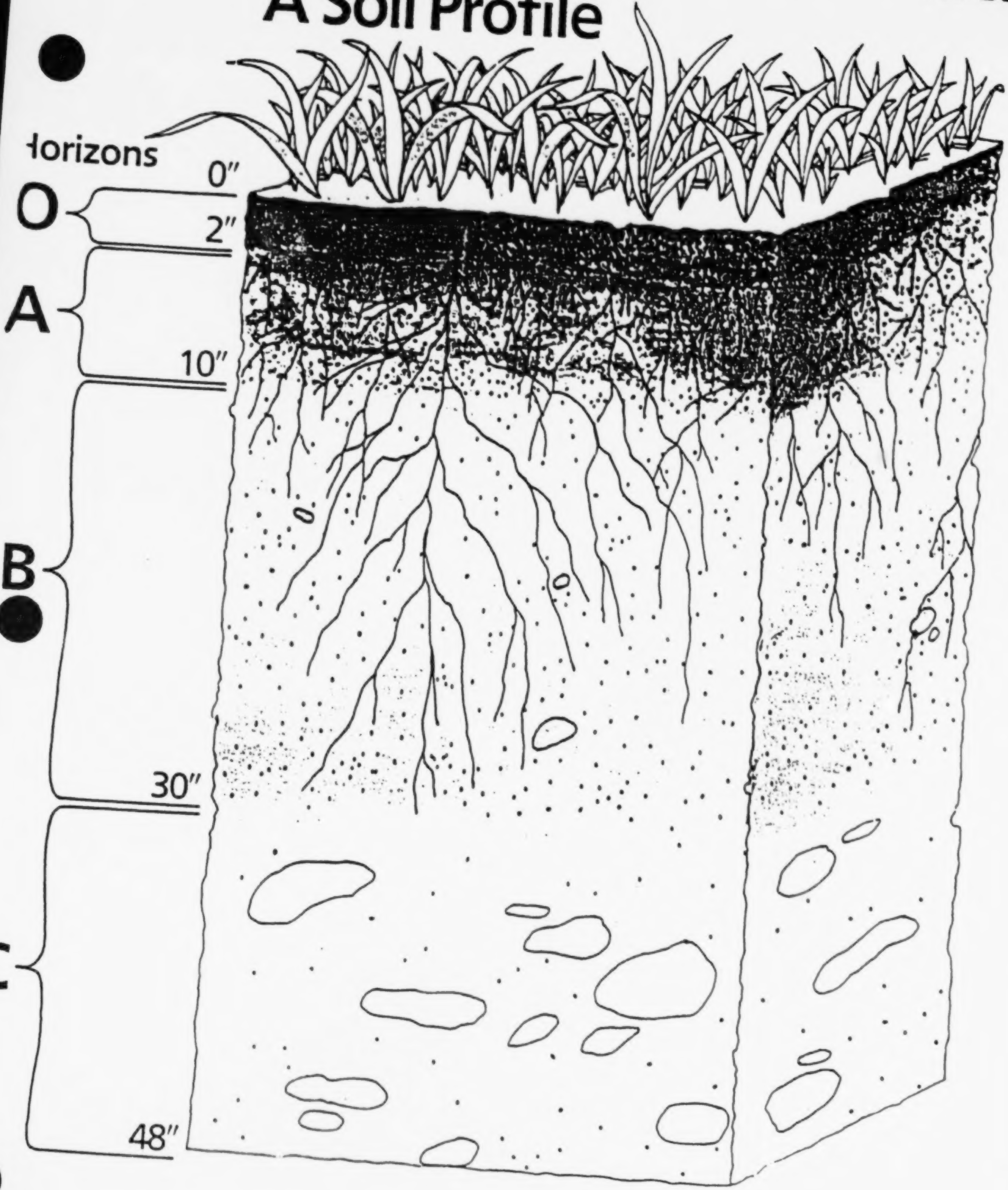
OTHER ACTIVITIES:

Other soils related activities may be selected from the Natural Resources Activities Handbook.

IDEAL SOIL PROPERITY RELATIONSHIP



A Soil Profile

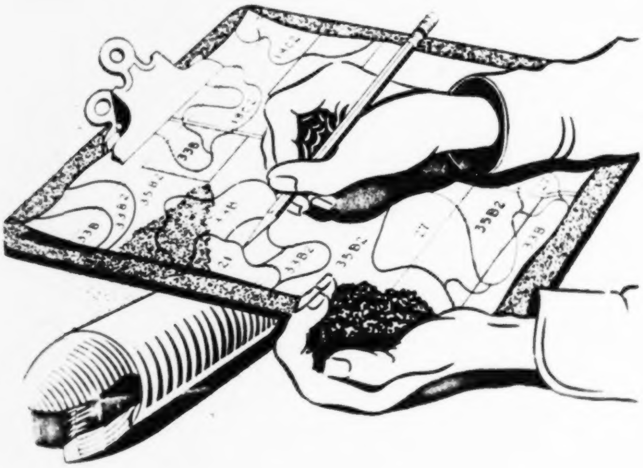

Horizons
0″
O
2″
A
10″
B
30″
C
48″

SOIL STRUCTURE

1. You are a soil scientist and you want to make a visual aid that will show the ideal proportion of major ingredients of soil. These ingredients are made up of water, air, inorganic matter (mineral - rock, sand, and metal), and organic matter (live or dead and decaying plants and animals). You decide to use a pie graph. Make a pie graph showing the percent of each of these materials that would be most ideal for productive plant growth and tell why you think the make up of soil ingredients which you have chosen is ideal.

2. Next you want your audience to appreciate the ideal texture of a soil for crop production. **If we use basketballs, baseballs, and beebees to represent the particle size within the makeup of soil texture (clay, sand, and silt), what would basketballs, baseballs, and beebees represent?** Sand, silt, and clay. Using the following example, describe the makeup of the favorable proportions of sand, silt, and clay for the most suitable crop production. A particle of sand is represented by a basketball, a particle of silt is represented by a baseball, and a particle of clay is represented by a beebee.

   If you were to demonstrate in a barrel the favorable proportions of the ideal texture of soil using basketballs, baseballs, and beebees representing particle sizes, what portion of the barrel would each of the three make up? Express in percent or ratio of one to the other two.



SOIL STRUCTURE

1. To have good soil tilth there must be a proper air-water relationship. Approximately one-half of the volume of soil is solid particles and one-half soil pores which is filled with a mixture of air and water.

   a. Soil tilth is very important in crop production. The physical condition of the soil that has most to do with air and water movement in the soil is called "soil tilth." A soil in good tilth breaks up easily into crumbs or granules about the size of wheat grains or soybeans. The crumbs are porous. They are made up of tiny bits of soil linked together something like popcorn in a popcorn ball. They hold this structure even when soaked.

   b. Organic matter gives soil in good tilth a sponge-like quality (crumb structure). It helps to keep the soil particles apart and makes the whole soil mass more porous. Most of the organic matter in the soil is due to the never-ending decomposition of plant and animal residues. Through decomposition organic matter is converted into simple compounds such as carbon dioxide, water and nitrate. The term "humus" often is applied to organic material which is in an advanced stage of the decay process. Through the action of soil microbes, organic matter is decayed and plant nutrients are released.

   c. The mineral portion of soils is inorganic materials divided into group sizes; sand, silt and clay. All living organisms need minerals to survive and grow.

   d. Soil must be well aerated, enough to permit all plant root cells to obtain oxygen at all times. Soil must be open for water infiltration, but not so much to allow excessive loss of water and plant nutrients by deep percolation.

2. To demonstrate the favorable proportions of the barrel full of basketballs, baseballs, and beebees; representing sand, silt, and clay for ideal crop production, the answer should be:

Basketballs	- sand, 40% of the barrel	- 2 parts
Baseballs	- silt, 40% of the barrel	- 2 parts
Beebees	- clay, 20% of the barrel	- 1 part

This represents a loam soil.

Soil scientists classify soil particles based on the following sizes:

Sand (0.05 - 2.0 millimeters in diameter)

Silt (0.002 - 0.05 millimeter in diameter - flour like)

Clay (smaller than 0.002 millimeter in diameter - smooth, sticky feeling)

Size of soil particles is important. The amount of open space between the particles has a lot to do with how easily water moves through a soil and how much water it will hold.

Too much clay, in proportion to silt and sand, causes a soil to take in water very slowly. Such a soil also gives up its water to plants slowly. These soils are sticky when wet and are easily compacted.

Sandy soils do not hold enough water for good plant growth and they are poor storehouses for plant nutrients.

Loam and silt loam refer to soils that have a favorable proportion of sand, silt and clay. The makeup of a soil is important as it affects the ease of working the soil, determines what crops can be grown on it, and how stable it is for supporting buildings.

A crumb structure in a top soil is, to a large extent, responsible for determining a soil's production capability. Crumb structure provides for favorable soil-moisture-air ratio in the top soil.

Intensive cultivation destroys soil structure (lowers the total pore space of soils).

From Soil Erosion by Water

Soil formation

Every soil has a history that affects its vulnerability to erosion. Soil forms through weathering and other processes that act on "parent material" – bedrock or other geologic material. Climate affects the rate of weathering, rates of geologic erosion and deposition of parent material, soil water content, and soil temperature. Relief – the configuration of the land surface – affects slope and drainage patterns on the landscape. Organisms – plants, animals, and micro-organisms – affect soil development chiefly by mixing soil material and adding organic matter. Over time – hundreds, thousands, even millions of years – climate, relief, and organisms form unique soils from the raw parent material.

Nearly all soils develop a series of different layers. In most undisturbed soils, the major layers are called the **surface** or **topsoil,** the **subsoil,** and the **underlying** or **parent material** (fig. 10). The content of organic matter is almost always highest in the surface layer, very low in the subsoil, and nearly absent below that.

By measuring the properties of each soil layer and by observing how various soils respond to use and management and to laboratory tests, researchers can estimate a soil's erodibility.

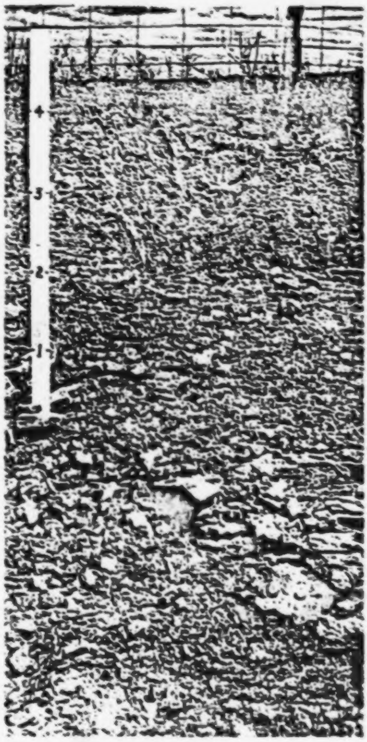


Figure 10. *A soil profile.*

Soil

Conservation planners need a thorough understanding of the soils at a site before they can develop a conservation plan. Four properties, mainly, determine a soil's erodibility:

- Texture,
- Slope,
- Structure, and
- Organic matter content.

Of the four, **texture** is generally the most important. It refers to the proportions of particles of sand, silt, and clay in a soil. Water moves detached clay particles more readily than particles of silt or sand, but clay particle bonds are generally stronger than those of silt and sand, so soils with a high content of clay may be quite resistant to erosion. More closely related to erodibility is the content of silt and sand – that is, particles with a diameter between 0.004 and 0.00008 of an inch. Texture is one inherent property of soil that is impractical to change.

Slope, like texture, is a "given" on the natural landscape. As slope steepness increases, so does the erosivity of runoff. The runoff then exerts more force on soil particles, breaking their bonds more readily and carrying them farther before deposition.

The longer water flows along a slope before reaching a major waterway, the greater is the potential for erosion.

From Soil Erosion by Water

In an undisturbed landscape, each major layer of most soils develops a unique, fairly stable **soil structure.** Soil particles are clustered in aggregates held together by physical and chemical bonds. The aggregates in turn form clumps called peds. Peds of a given undisturbed soil have a consistent appearance and size range, but intensive use of a soil can alter the natural soil structure (fig. 11).

Shape, size, and arrangement of aggregates determine the pathways of infiltrating water and the volume of air space between aggregates. The more air space a soil has, the more room it has for infiltrating water. Reduced infiltration capacity is often the major reason for declining yield on an eroding soil. In turn, reduced infiltration leads to more runoff – and more erosion.

Land use practices can strengthen or weaken aggregate bonds and can increase or decrease the size of the aggregates. Strong bonds and large aggregates provide more resistance to erosion than weak bonds and small aggregates.

Excessive tillage tends to break down peds and aggregates, lowering the erosion resistance of soil particles and the volume of air space in the soil. In most soils, structure can be improved by reducing the frequency and depth of tillage, avoiding tillage when the soil is wet, and increasing the soil's content of organic matter.

Organic matter is the decomposed remains of plants and animals. Plentiful organic matter helps soil fertility, water infiltration and storage, and soil structure. Increasing the content of organic matter is a principal means of improving soils that have been damaged by erosion; it is a very slow process.

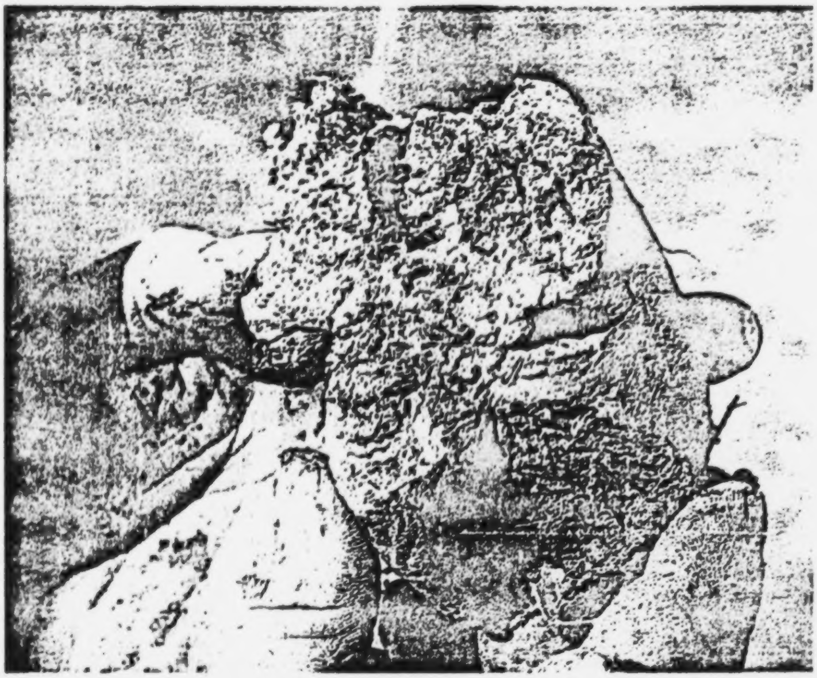


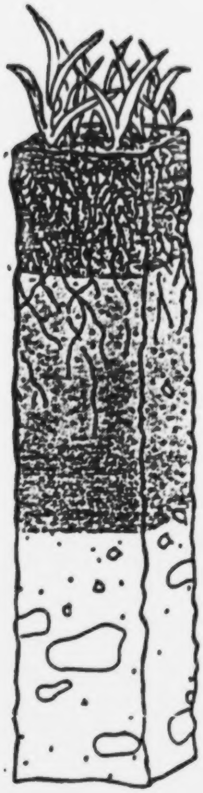
Figure 11. *A ped.*

When European colonists cleared southeastern forests to grow crops, yields were high at first because of the large amounts of plant nutrients supplied by organic matter in the soil. In many areas, cotton, tobacco, or other cash crops were grown year after year without intervals of soil-building crops such as alfalfa. As a result, erosion increased, nutrients and organic matter became depleted, yields decreased, and crop failure became more likely, until abandonment of the land was the only remaining option.

Today, continuous row crops can contribute to soil erosion and nutrient depletion unless adequate management practices are used, including a crop rotation that restores organic matter.

Crops can be grown in soils that are low in organic matter. Generally, however, tillage is more difficult and expensive, more fertilizer is needed, and yields are lower.

SOIL FORMATION, STRUCTURE, AND TEXTURE



1. **What is an ideal proportion of air, water, mineral and organic makeup for good soil tilth? _________% air; _________% water, _________% mineral; and _________% organic matter.**

2. **What soil texture is best suited for crop production?**

3. **Describe the three major layers of soil.**

4. **How can we improve soil structure?**

5. **Even though crops can be grown in soils that are low in organic matter, what are the problems in doing so?**

6. **What four properties of soil mainly determine the soil's erodibility?**

SOIL FORMATION, STRUCTURE, AND TEXTURE

1. **Ideal proportions of air, water, mineral, and organic matter makeup for good soil tilth are:**

   25% air, 25% water (50% pore space),
   45% mineral, and 5% organic matter.

2. **What is the soil texture best suited for crop production?**

   Loam or silt loam made up of from two parts sand, 2 parts silt, and one part clay ranging up to one part sand, nine parts silt, and two parts clay.

3. **Describe the three major layers of soil:**

   Surface or top soil with the greatest percent of organic matter and plant nutrients.

   Subsoil beneath the topsoil has low organic matter content.

   Parent material (beneath the subsoil) bedrock or other geologic material from which soil forms through a weathering process.

4. **How can we improve soil structure?**

   By increasing the content of organic matter, reducing the frequency and depth of tillage, and avoiding tillage where the soil is wet.

5. **Even though crops can be grown in soils that are low in organic matter, what are the problems in doing so?**

   Tillage is more difficult and expensive, more fertilizer is needed and yields are lower.

6. **What four properties of soil mainly determine the soil's erodibility?**

   Texture, slope (length and steepness), soil structure, and organic matter.

A Soil Profile Transparency

Background Information

A soil profile is a slice of earth several feet deep. It shows layers of soil — some less than an inch thick, some over 2 feet thick.

By studying soil profiles, scientists learn about the soil, its characteristics, and how to use and protect it.

Sand, silt, and clay are the various sized particles that make up soils. The texture of a soil is determined by the relative amounts of these particles in the soil. For example, a sandy clay soil may contain about 50 percent clay, 45 percent sand, and 5 percent silt. Loam soils contain about equal amounts of all three.

Some soils were formed by the breaking down and weathering of rock. Others were formed from materials transported and deposited by water, wind, or glaciers. Deep soil layers and rock change very slowly.

It takes 100 to 600 years, or more, to form an inch of topsoil. Wind and water erosion can remove that much topsoil in a single year. When a soil erodes excessively, the exposed subsoil is more difficult to cultivate and less productive for plant growth.

About the Transparency

Most soil profiles have a surface layer of organic material and two or three layers of mineral materials. These are the horizons of a typical soil profile.

If present as organic material, the 0 horizon at the top is usually less than an inch thick. The dead plant and animal materials decompose into nutrients that enrich the soils.

Topsoil, the A horizon, is the upper soil layer. Plant roots, bacteria, fungi, and small animals are abundant. Plants thrive in it. It has more organic matter and is darker than the subsoil.

Subsoil, the B horizon, is the middle soil layer. It has fewer organisms and less topsoil. Plants don't grow as well in it. If subsoils are clayey, they usually are harder when dry and stickier when wet than the surrounding soil layers.

The C horizon is the lowest layer. It is less altered and weathered than the layers above and has less living matter. It may be called the parent material. It gets this name because it is the weathered rock and partly weathered soil from which the soil layers above were formed.

Transparency Use: Write on it with a grease marker. Remove markings with a dry towel. Permanent-ink writing can not be removed.

Activities

★Use the transparency to introduce the topic of a soil profile.

...What differences are there in the horizons? (depth, color, plant growth, soil particle or rock size)

...Why is the particle size important to plant growth and the water-holding capacity of soil? (more total surface area on small particles, better aeration/water flow through mixed soil sizes)

...What results if plant cover is absent? (soil erosion/lost fertility)

★Locate different soil profiles in streambanks, roadside cuts, and building-site excavations. Have students point out color, texture, and appearance changes in the horizon, measure horizon depths, sketch the profiles studied.

★Fill a fruit jar 2/3 full of water, add soil to nearly fill it; shake vigorously. Let soil fully settle. Have students hold paper beside the jar, draw the different layers, and label each as clay, silt, sand, or rocks.

★Collect samples of sand, silt, and clay from various sites. Have students examine and describe each sample. Identify soil textures (most examples will be mixtures).

★Show how soil is created.

...By abrasion: Rub together limestone, sandstone, brick, or concrete

...By heating: Fully heat limestone and drop it in ice water; it should crack or break.

...By freezing: Freeze water in a glass jar; what happens to the jar? Water trapped in rock freezes and rocks break into smaller and smaller pieces.

Provided by USDA Soil Conservation Service

LESSON THREE

THE EROSION PROCESS

LESSON: Understanding the Erosion Process

OBJECTIVES:

After completion of this lesson, participants will be able to:

1. Identify causes and types of erosion.
2. Compare factors used in predicting water and wind erosion rates.
3. Recognize the damage to unprotected soil caused by the raindrop.
4. Recognize associated careers.

MATERIALS AND REFERENCES:

Overhead Projector

VISUAL MASTERS:

VM-PROCESS-1, Force of the Raindrop

VM-PROCESS-2, Raindrop Damage to Unprotected Soil

ACTIVITIES:

ACT-PROCESS-1, Soil Erosion and pages 40-45.
KEY-ACT-PROCESS-1, Soil Erosion
ACT-PROCESS-2 (Three pages), Science of the Erosion Process
KEY-ACT-PROCESS-2, Science of the Erosion Process

ASSOCIATED CAREERS:

Soil Scientist
Soil Conservationist
Researcher
Agriculture or Civil Engineer
Agronomist
Farmer

Developed by Eldon Weber, May 1988

INTEREST APPROACH:

Now that you better understand soil structure and how it is held together, let's look at **what forces cause it to leave the soil surface and move to another location?** Place the following question on the chalk board and ask for the answer: **What is soil erosion?** Answer: "To eat away; to destroy by slow consumption" or "the wearing away of soil by forces of water and wind."

Place the following question on the chalk board and ask for an answer: **What is the greatest force that causes soil to detach from the surface?** Use **VM-PROCESS-1** to illustrate the force of the raindrop. The raindrop has an average force of 10,000 pounds of TNT over an acre during a year's time. Iowa receives 40 percent of its erosion rainfall when there is no growing crop to provide a protective cover for the soil.

Ask, **have any of you ever seen or heard the explosion of dynamite?** It is a sizeable force, as is the raindrop on bare soil.

Use **VM-PROCESS-2** to illustrate. Let's analyze the damage caused by raindrops on unprotected soil. The raindrop detaches soil from the soil surface. Raindrops hitting bare soil also break down soil tilth. The raindrops blast the porous crumbs (aggregates) into fine particles. The fine soil particles then run together and seal the soil which leads to crusting. Soils with low organic matter are much more apt to crust than those with high organic matter.

Place the following question on the chalk board and ask for an answer. **What can we do in crop production to reduce the force of the raindrop?** Answer: Maintain crop residue on the surface (conservation tillage).

TEACHING PROCEDURE (allow 40 minutes):

1. Use **ACT-PROCESS-1.** Have students complete questions with an open paper reading assignment.
2. Use **KEY ACT-PROCESS-1** for the answers and a discussion of other highlights from the reading assignment.
3. Hand out **ACT-PROCESS-2** for the next student activity. Use **KEY ACT-PROCESS-2** in a discussion to provide answers.

4. Place the following question on the chalk board and ask for answers: **What careers are associated with the topic covered in this lesson and how are each tied to the subject of soil erosion?**

   Soil Scientist and Agronomist: Studies and applies principles associated with the soil properties affecting the erosiveness of soils.

   Soil Conservationist: Assesses and calculates soil erosion in assisting farmers in planning and implementing conservation systems.

   Researcher: Studies soil properties.

   Agriculture and Civil Engineer: Plans and designs dams and other erosion control structures.

   Farmers: Adapts conservation systems to soil and water conditions and needs.

5. It is evident from these questions concerning the loss of productivity due to erosion that we need more answers. **What is erosion costing farmers in reduced yields and increased fertilizer costs? What are the damages to society resulting from unchecked erosion?** We'll deal with these issues in future lessons.

6. In conclusion, we have:

   1. Identified causes and types of erosion.

   2. Compared factors used in predicting water and wind erosion rates.

   3. Recognized the damage to unprotected soil caused by the raindrop.

   4. Recognized associated careers.

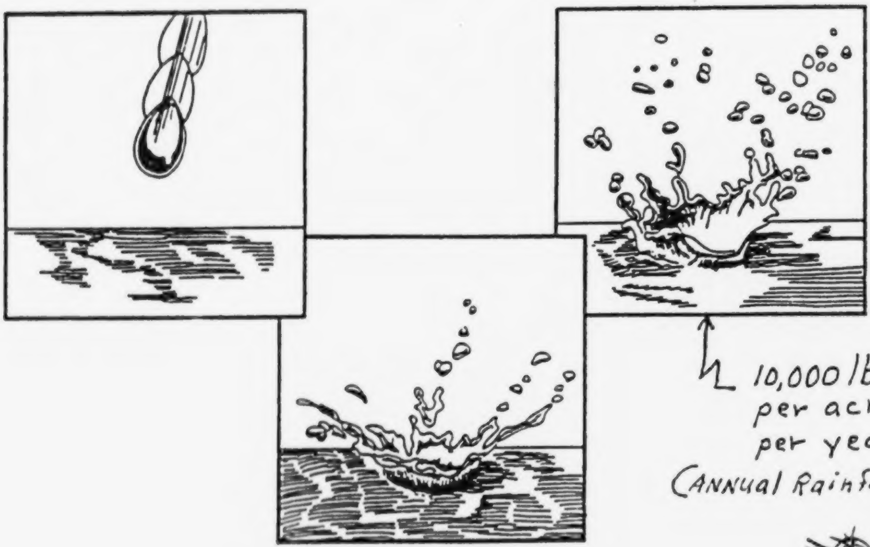
OTHER ACTIVITIES:

See the Natural Resources Activities Handbook for other erosion related activities.

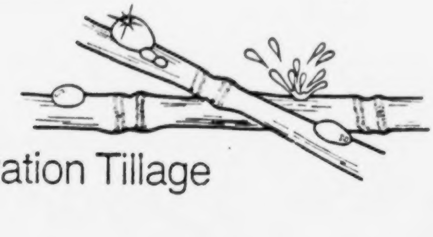
FORCE OF THE RAINDROP

WHAT IS ITS AFFECT ON THE SOIL SURFACE?

WHAT CAN WE DO IN CROP PRODUCTION TO REDUCE THE FORCE OF THE RAINDROP?



10,000 lbs. TNT
per acre
per year
(Annual Rainfall Impact.)



Control the Splash with Conservation Tillage

Raindrop Damage to Unprotected Soil

1. Soil detached from soil surface

2. Breaks down soil tilth

3. Reduces soil aggregates to fine particles

4. Fine particles form a seal leading to crusting

ACT-PROCESS-1

SOIL EROSION

1. How much top soil have we lost in Iowa in the last 100 years?

2. What type of erosion is most invisible and how does ephemeral erosion differ from gully erosion?

3. How much erosion takes place in Iowa each year?

4. What are the direct costs of erosion to farmers?

5. What does a five ton per acre per year soil loss tolerance mean, (T) level?

6. What are some of the forms of loss of soil productivity due to erosion damages?

7. How are urban people adversely effected by damages from erosion?

Erosion — What You Do and Don't See

The danger in soil erosion is not in its immediate impact. The danger lies in the fact that it is unrelenting and often unnoticed.

Those closest to the land may not notice small changes in their land after each rainstorm. But just as children change day by day, land changes rain by rain.

Water running off the land erodes more topsoil than any other natural force. Water runoff takes soil with it in two forms: 1) sheet and rill erosion, which removes topsoil in thin layers and narrow channels, and 2) gully erosion, which gouges topsoil and subsoil out of drainageways to form gullies that farm equipment can't cross.

Erosion: to eat away; to destroy by slow consumption

Ditches or small rills in row-cropped fields, soil deposits in fencerows and road ditches, and muddy water are all signs of soil erosion by water.

Wind is another natural force that erodes soil. Clear evidence of wind erosion includes dust in the air and deposits of wind-blown soil in road ditches.

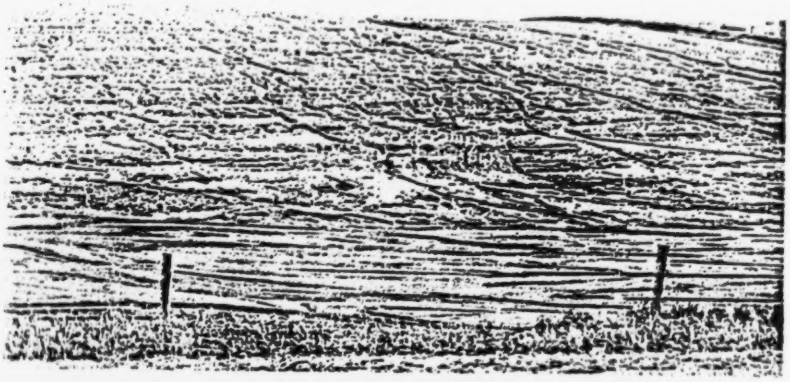
A 1982 study by the U.S. Department of Agriculture (USDA) showed that Iowa has the worst soil erosion of any state — an average of 9.4 tons per acre on 26.1 million acres. That amounts to nearly 240 million tons, equivalent to 1/16 of an inch of topsoil each year. This rate is twice the national average.

The truth is, erosion cannot be stopped . . . completely. But with a soil conservation system designed to fit individual farming operations and soils, it can be limited to a rate that will allow sustained soil productivity.

Sheet erosion (water)
Sheet erosion is almost invisible. Lighter colored soils are a sign that over the years it has taken its toll.

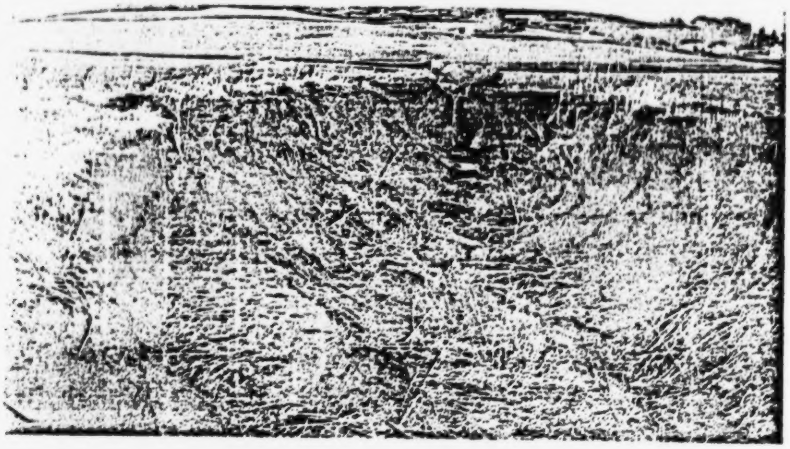
Wind erosion
Wind erosion is highly visible. While it is a problem, in most cases erosion by water is much more severe.

From Losing Ground ACT-PROCESS-1



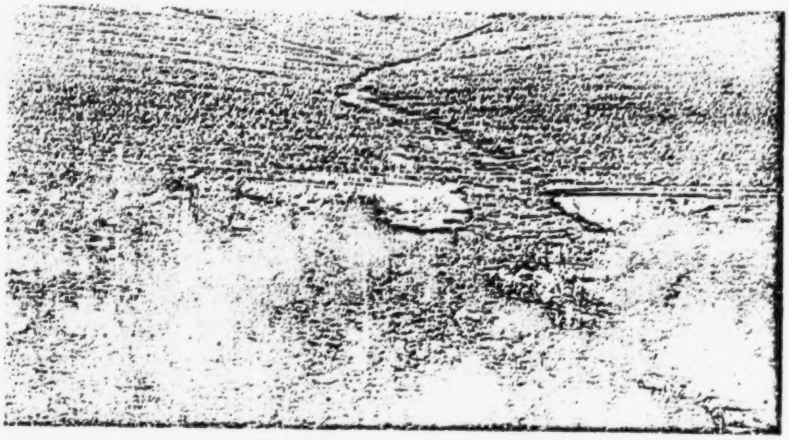
Rill erosion

During heavy rains, small rills can form over an entire hillside, making farming difficult.



Gully erosion

Gullies, some of them huge, are impossible to cross with farm machinery.



Ephemeral erosion

Ephemeral erosion occurs in natural depressions, rain after rain. It differs from gully erosion in that the area can be crossed by farm equipment.

Soil Erosion in Perspective

In a little over 100 years, farming in Iowa has moved from cultivation with horses to growing crops with the most sophisticated technology in the world. In 1860, less than 3 percent of Iowa's land, about 1 million acres, was planted to corn. In 1986, the figure was more than 13 million acres.

Soil erosion has always been a problem, in direct proportion to the amount of land lain bare to the forces of water and wind. Diversified farming, which included crop rotations, helped to control soil erosion in the 1940's and 1950's.

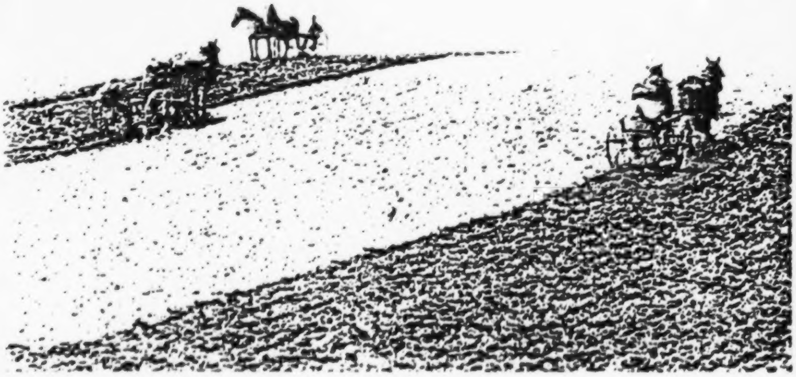
By 1960, improved corn varieties and increased use of fertilizers helped to more than double the top corn yields in 1940. By 1970, bigger farm equipment led to more uphill and downhill farming. Soybeans were catching on as another major row crop, and the stage was set for increased soil erosion.

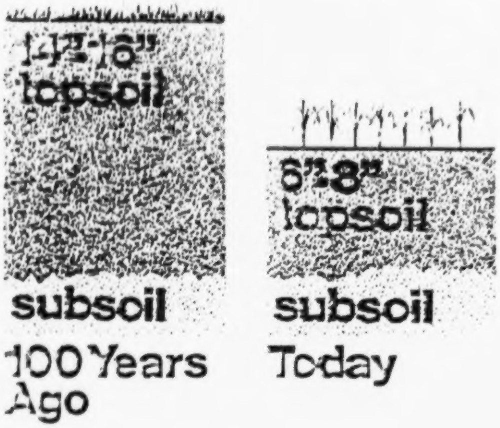
Today, progress has been made in soil-saving programs. But because of high acreages of erosion-prone corn and soybeans, only about one-third of the land is protected.

Half the original topsoil — 6 to 8 inches — has been lost from Iowa's unprotected sloping soils in the 100 years they have been farmed. At this rate, the remaining 6 to 8 inches could be gone within 100 years.

Topsoil is being lost much faster than it is being replaced — nature needs 250 to 1,000 years to build an inch.

Soil erosion was a problem in horse farming days with uphill and downhill farming (right); erosion has been accelerated as more land has been planted to soybeans and corn (below).





Why control erosion?

On and off the farm, the annual price tag for erosion damage in the United States is estimated to be in the billions of dollars. But the full cost of erosion is unknown. For example, there is no estimate of the effects of sediment and associated pollutants on human health.

On one-fourth of the Nation's cropland, soil erosion by water exceeds the rate considered to be allowable. On this land, soil productivity cannot be economically sustained unless erosion is reduced.

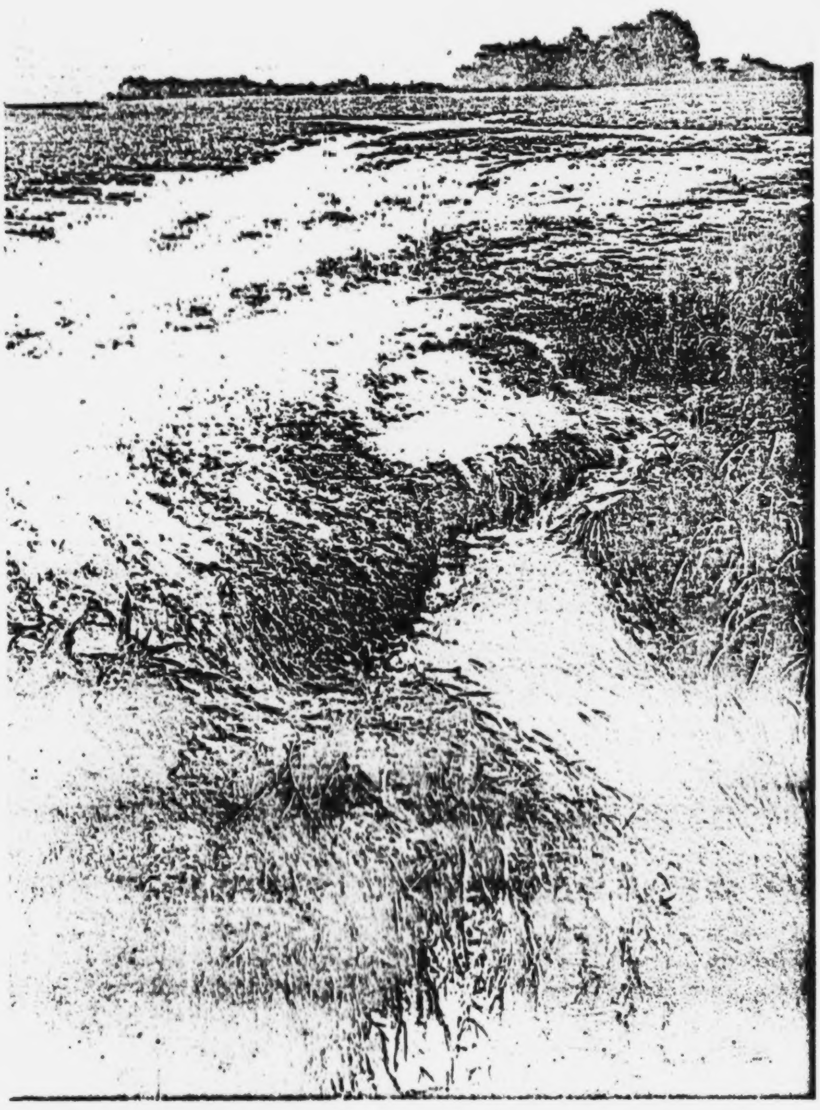


Figure 1. *Onfarm damage from erosion.*

Erosion increases the cost of farming. This increase contributes to lower profits for farmers and higher food prices for consumers. Onfarm damage from erosion includes lower yields of crops or forage, higher fertilizer requirements, more difficult tillage, and higher bills for farm maintenance (fig. 1).

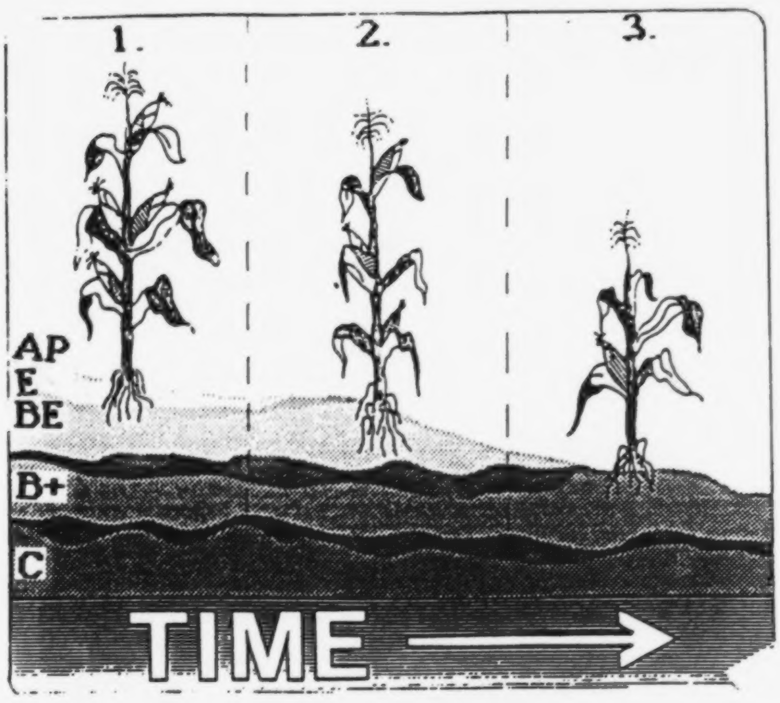
Sediment from eroding areas clogs rivers and decreases reservoir capacity, thereby restricting navigation, reducing recreation and scenic value, and increasing the hazard and severity of flooding.

Sediment, along with accompanying plant nutrients and pesticides, can destroy fish and wildlife habitat and pollute water supplies.

You help pay the bill for erosion damage. But do you feel its effects directly? Not usually, especially if you live in an urban area. Out in farm country, however, ask a farmer about that abandoned, gullied field: "Did erosion do that?" Ask the rancher who over a lifetime has seen lush grassland reduced to scrub and gullies by overgrazing that allowed excessive erosion. Ask the fisherman who no longer bothers to toss a line into a lake now choked by algae and mud. Ask the public official who uses tax dollars to remove sediment from road ditches, to dredge sediment from rivers and reservoirs, and to remove harmful chemicals from the water supply.

Ask these and other people about the damage erosion can cause . . . and then ask yourself whether you should make erosion control *your* business.

SOIL-PLANT RELATIONSHIP



1. WHAT DIFFERENCES DO YOU SEE IN THESE THREE CORN PLANTS?

2. WHAT CONDITIONS DO YOU SEE THAT WOULD CAUSE A DIFFERENCE IN NUMBERS OF EARS AND PLANT GROWTH?

3. DO YOU KNOW OF FIELDS IN YOUR AREA WHERE PLANTS SHOWN IN 2 AND 3 ABOVE ARE EVIDENT?

How erosion became a national problem

Our soil erosion problems began in colonial times. Erosion on colonial farms was often severe because farmers did not adapt European farming methods to the different climate in North America. In England, for example, much of the rain falls as relatively low-intensity or small raindrops during long storms. But in North America, most rain falls as large drops in intense storms.

Another reason for erosion was economics. Rather than invest in their soil by rotating crops and adding manure, many farmers grew the same cash crop every year until the soil was depleted of nutrients and organic matter. Then they farmed somewhere else. After all, land was cheap and plentiful.

The development of farm tractors began in the early 1900's, enabling a farmer to produce crops on many more acres in much less time.

Later, during the 1930's, economic depression left millions of Americans unemployed. Many banks, factories, and other businesses failed. Thousands of farmers went broke because of scarce credit, poor markets, recurring drought – and severe erosion.

Across the Dust Bowl, an area that centers on the Oklahoma Panhandle, soil eroded by strong winds repeatedly blackened the sky. In the Midwest and Southeast, decades of poor management had led to severe erosion damage on millions of acres of farmland.

Erosion had become a major threat to the recovery of the Nation's economy. In this atmosphere of crisis, the Congress in 1933 established the Soil Erosion Service, which in turn established demonstration projects to show farmers how to control soil erosion. In 1935, Congress transferred the agency to the United States Department of Agriculture (USDA), renamed it the Soil Conservation Service, and increased its duties to include technical help to farmers. Erosion control had become a public as well as private responsibility.

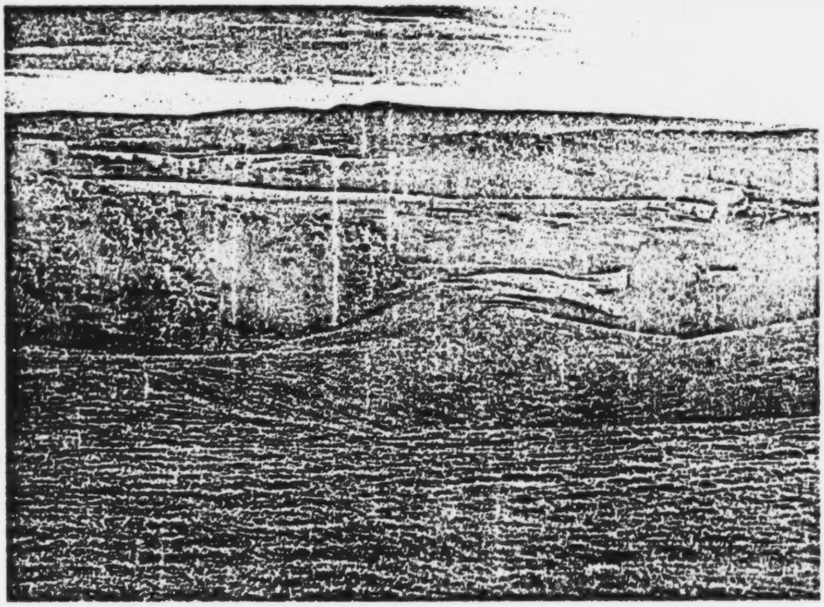


Figure 2. *A very old and stable landscape.*

> ❝When our fore-Fathers settled here . . . the Land being new they depended upon the Natural Fertility of the Ground . . . and when they had worn out one piece they cleared another. . . .❞ (fig. 2)
>
> *—Jared Eliot, Connecticut minister, doctor, and farmer, 1748*

Because farmers needed local help in planning and applying conservation, soil conservation districts were formed. By the late 1940's, nearly every acre of privately owned land in the Nation was part of a conservation district. These districts are local units of State government and have primary responsibility for local conservation programs. Districts provide help directly to land users, and they are the main conduit for conservation assistance from State and Federal government.

USDA provides most of this assistance; an increasing amount of help is being given by State and local governments.

Much of the technology for conservation help was developed in SCS or resulted from research by land grant universities and USDA's Agricultural Research Service. Some conservation work is eligible for cost-sharing by USDA's Agricultural Stabilization and Conservation Service. And SCS also works closely with USDA's Forest Service, the Bureau of Land Management in the Department of the Interior, the U.S. Environmental Protection Agency, and other Federal, State, and local agencies.

Erosion and soil productivity

Researchers, conservationists, and farmers know that erosion can rob the soil of its productivity. But they also know that erosion does not simply penalize yield by some fixed number of bushels per ton of soil loss.

A rule of thumb is that 1 inch of topsoil takes about 30 years to form from subsoil material. Subsoil forms from the parent material even more slowly. Since 1 inch of soil from 1 acre weighs about 150 tons, many conservationists believe that erosion should be held at or below 5 tons per acre per year on most deep soils. At this rate, it would take 33 years to lose that 1 inch of soil; therefore, soil is being formed nearly as fast as it is lost.

Over the years, the Soil Conservation Service has established **soil loss tolerance** (T) levels. These T levels indicate the maximum average annual erosion rate consistent with sustaining the soil's long-term productivity and with avoiding such problems as severe rilling, gullying, and nutrient losses.

For many years, SCS erosion-control planning with land users has focused on the goal of reducing average annual erosion to T. The T level, however, does not consider other damage from erosion, such as water pollution from sediment and associated nutrients and pesticides.

In some parts of the country, loss of productivity caused by erosion is easy to see – in stunted crops, low yields, bare spots, crops buried by mud, and gullies chewing into productive fields. But measuring the actual damage on specific soils can be very difficult. Besides erosion, crop yields are affected by many other physical, chemical, climatic, management, and soil factors.

Many questions have to be answered to obtain a meaningful estimate of erosion's effect on the productivity of a particular field, including the following:

- Can the farmer afford the cost of replacing losses of organic matter and of the major nutrients nitrogen, phosphorus, and potassium?
- Does the crop need other nutrients such as zinc, which are lost with eroded soil?
- Does plentiful and frequent rainfall offset the eroded soil's loss of water-holding capacity, or does arid climate make this problem even worse?
- Is the depth to bedrock only 24 inches – or more than 200 inches?
- Does the subsoil resemble the topsoil except for having a lower percentage of organic matter? Or is the subsoil more clayey or acid than the topsoil?
- Is the farmer growing continuous cotton, corn, or soybeans – or using a crop rotation that includes 1 or more years of soil-building cover crops?
- In a field with both eroded and uneroded areas, is the farmer overfertilizing the uneroded areas as a result of trying to maintain production in the eroded areas?

In recent years, conservationists have developed computer programs or models of the erosion process and its effects. These models account for the interaction of many time- and space-dependent factors that affect erosion or crop production.

An example of such models is EPIC (Erosion-Productivity Impact Calculator), which was developed by the scientists in USDA's Agricultural Research Service with help from universities and SCS conservationists. EPIC incorporates data on soils, hydrology, weather, crops, and management activities such as tillage and fertilization. The model can estimate erosion rates and the change in crop yield over time in response to erosion. Results from EPIC and other models can be used to estimate the cost of erosion and to help farmers improve their management of the land.

However we estimate the cost of erosion for productivity, we are left with the knowledge that technology has not developed a large-scale replacement for soil as a medium for growing crops.

Lost productivity

Erosion damage to soil productivity takes many forms. Some of the most common are the following:

- With the loss of topsoil, the soil has a lower capacity to hold and store water for use by plants. The soil is more vulnerable to drought.
- Erosion results in the loss of organic matter and of plant nutrients that are already present in the soil or are applied in chemical fertilizers. Some nutrients are lost because they are attached to eroded soil particles; water-soluble nutrients are lost in surface runoff.
- Uncontrolled runoff and deposits of sediment can damage the seedbed and seedlings.
- In many soils, layers with unfavorable properties are brought nearer to the surface and eventually exposed as the topsoil erodes. Such properties can include low organic matter content, high clay content, reduced availability of phosphorus, and root-limiting layers or bedrock.
- Erosion tends to make a field more variable, with rilled, gullied, and other eroded areas alternating with uneroded areas and areas where eroded soil has been deposited. One typical result is that some areas get too much fertilizer while others don't get enough.
- Gullied areas are not only useless for crop production or grazing but also can make the entire field unusable or extremely difficult to farm with modern-day equipment.

SOIL EROSION

1. **How much topsoil have we lost in Iowa in the last 100 years?**

   Approximately one-half (1/2), 6 to 8 inches

2. **What type of erosion is most invisible and how does ephemeral erosion differ from gully erosion?**

   Sheet erosion is most invisible. Ephemeral erosion in natural depressions is crossable by farm machinery, gully erosion is uncrossable with farm machinery.

3. **How much erosion takes place in Iowa each year?**

   On the average of 9.4 tons per acre on 26.1 million acres or 240 million tons

4. **What are the direct costs of erosion to farmers?**

   Lower farm profits, lower yields, higher fertilizer requirements, more difficult tillage, higher bill for farm maintenance, and increased hazard and severity of flooding. Sediment along with accompanying plant nutrients and pesticides can destroy fish and wildlife habitat and pollute water supplies.

5. **What does a five ton per acre per year soil loss tolerance mean, (T) level?**

   That is the maximum average annual erosion rate per acre allowed at which soil is being formed from parent material approximately the same rate (soil loss balances soil formation). Five (5) tons per acre per year is a common (T) value, however, the "T" value varies with soil type.

6. **What are some of the forms of loss of productivity due to erosion damages?**

   With loss of top soil, the surface layer of soil has a lower capacity to hold and store water for use of plants. The soil is more vulnerable to drought, loss of organic matter and plant nutrients, unfavorable properties in subsoil brought closer to surface or eventually exposed to the surface like low organic matter, high clay, reduced availability of nutrients, root limiting layer or bedrock, varied fertility needs within a field, difficulty in farming.

7. **How are urban people adversely effected by damages from erosion?**

   Sediment from eroding areas along rivers and water areas reduces reservoir capacity; restricts navigation, reduces recreation and scenic values, increases the chance and severity of flooding, destroys fish and wildlife habitat, pollutes water and increases cost of food.

SCIENCE OF THE EROSION PROCESS

Introduction

We've read about the fact that Iowa is losing an average of 9.4 tons of soil per acre per year and that one-half of Iowa's topsoil has been eroded away by a century of farming. At this rate of erosion, the remaining six to eight inches could be gone in 100 years. Aren't those statements just speculation? The answer, no; they are not just speculation. Water and wind equations have been scientifically developed to give us good predictions of rates of soil loss by those two natural forces.

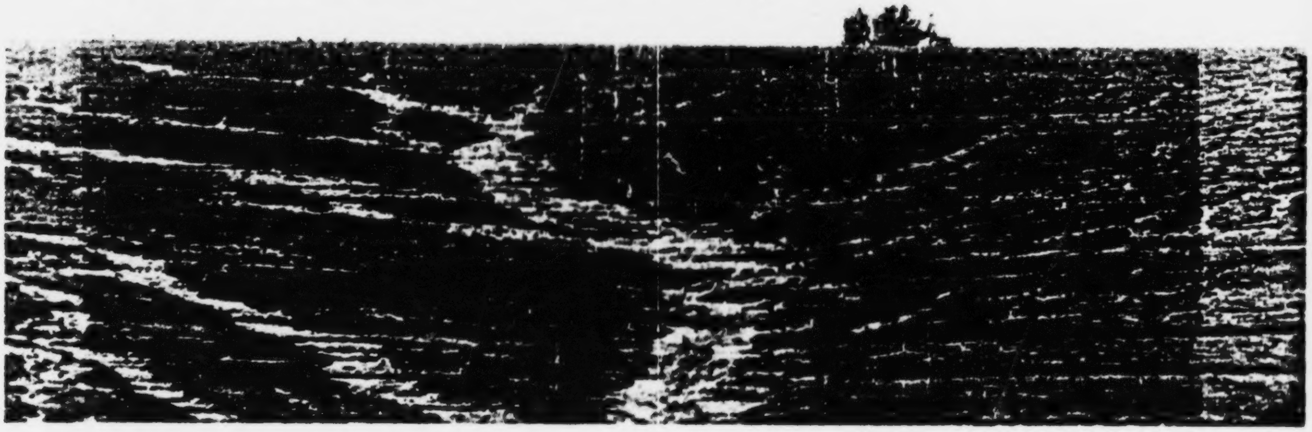
Assignment

1. Review ACT-PROCESS 3 and 4 and answer the following questions:
   a. What climatic factors are included in the two equations?
   b. What factors in the two equations deal with: (a.) characteristics of soils, (b.) land surface features and (c.) land cover?
   c. The equations do not predict soil loss from a particular storm, but what do they predict?

A = RKLSCP

A = Soil loss predicted
R = Rainfall factor
K = Soil Erodibility
LS = Length and Steepness of slope
C = Cropping and Management
P = Conservation Practice

The Universal Soil Loss Equation



What it is

The universal soil loss equation is a scientifically based formula used to predict average annual soil losses from a particular cropland field. It predicts only sheet and rill erosion from a hillside — gully erosion and erosion by wind are estimated using other formulas.

The formula, A = RKLSCP, is the result of more than 50 years of erosion research. More than 10,000 plot-years of data and rainfall records from 2,000 weather stations have gone into it — the factors are constantly being field-checked and fine-tuned for accuracy.

The equation does not determine soil losses for a particular storm or year (field measurements may be taken to determine single storm losses). Rather, the equation predicts average losses over a period of time.

It's important to know also that the equation does not predict how much soil ends up in a lake or stream — it predicts how much soil erodes from a particular slope of a field.

How it works

All Soil Conservation Service and Extension Service offices have charts to calculate expected soil losses from cropland. They can assist in figuring current losses on a particular field. They can also help determine which conservation practices or farming methods could reduce losses, and by how much.

Example. A field in northwest Iowa has Sac silty clay loam soil, with 7 percent slopes 350 feet long. The cropping is a 3-year rotation of corn - beans - oats with a catch crop. The corn is fall plowed with a moldboard plow and soybeans are chisel plowed in the fall. Field operations are up and down hill. Average soil loss is 21.5 tons an acre each year, and the equation looks like this:

$$\mathbf{A = R \times K \times L\,S \times C \times P}$$

$$21.5 = 150 \times .32 \times 1.6 \times .28 \times 1$$

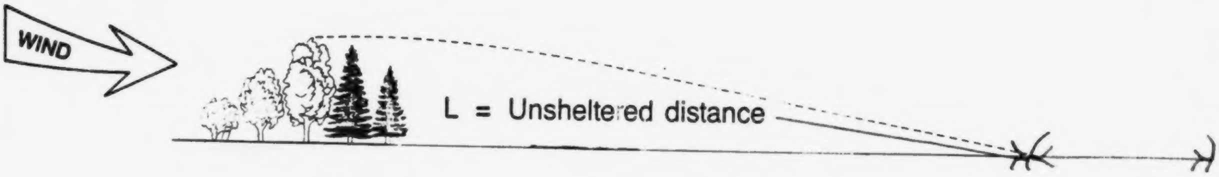
If parallel, level, grassed backslope terraces were built, with the rotation and soils the same as above, the result is a reduction from 21.5 tons/acre to 3.7 tons/acre. Another alternative would be to contour and switch to no-till farming, or putting 2 years of meadow in the crop rotation — both methods would cut erosion to below 5 tons an acre. Many alternatives can be considered. The equation is an important tool to a farmer who wants to protect topsoil while using the cropping system and conservation practices that best fit the situation.

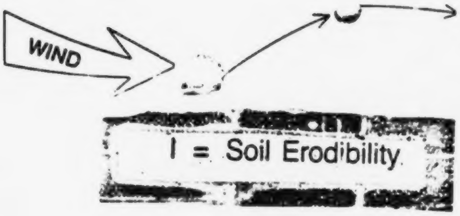
$$E = f(IKCLV)$$

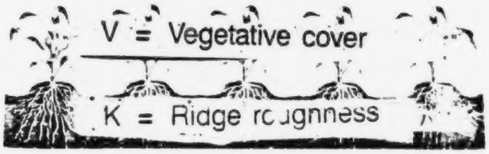
E = Soil loss potential
f = Function of
I = Soil Erodibility
K = Ridge roughness
C = Climatic factor
L = Unsheltered distance
V = Vegetative cover

The Wind Erosion Equation

For wind erosion, the equation is $EI = CI/T$, where (C) is a climatic value of wind speed and surface soil moisture and (I) is the degree to which soil resists wind erosion.


WIND
L = Unsheltered distance


WIND
I = Soil Erodibility


V = Vegetative cover
K = Ridge roughness

KEY-ACT-PROCESS-2

SCIENCE OF THE EROSION PROCESS

1. What climatic factors are included in the two equations?

USLE (water erosion)	Wind Erosion
(R) Rainfall	(C) Climatic Value of Wind Speed

2. What factors in the two equations deal with:

	USLE (water erosion)	**Wind Erosion**
a. Characteristics of soils	___(K) Soil Erodibility (Soils resistance to erosion by water)	___(I) Soil Erodibility (Soils resistance to erosion by wind)
b. Land surface features	___(LS) Length and steepness of slope	___(K) Ridge roughness (L) Unsheltered distance
c. Land cover	___(C) Cropping and management of crops	___(V) Vegetative cover

3. The equations do not predict soil loss from a particular storm, but what do they predict?

Potential soil loss expressed in tons per acre per year over a period of time.

LESSON FOUR

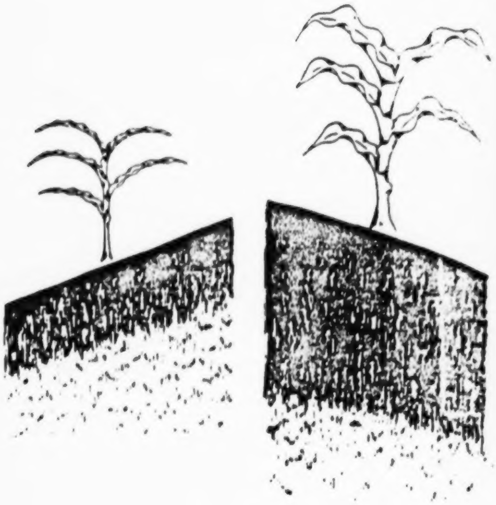
CONNECTION OF SOIL AND ITS PRODUCTIVITY

LESSON 4

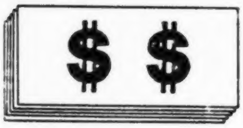
SUBJECT: Understanding the Connection Between Soil and Its Productivity

OBJECTIVES:

After completion of this lesson, participants will be able to:



1. Recognize the important variables influencing crop yields.
2. Recognize basic procedures used in agriculture research.
3. Identify the results expected from the erosion/productivity study.
4. Identify the types of data collected for the erosion/productivity study.
5. Understand the principles in the systems approach in crop production, water quality and soil conservation.
6. Understand the importance of records in crop production using the systems approach.



MATERIALS AND REFERENCES:

Video (third program on Soil Conservation Tape 1, Erosion/Productivity Connection.

Video Player

Overhead Projector

Developed by Eldon Weber, May 1988

VISUAL MASTERS:

VM-EROS-1, Soil-Plant Relationship
VM-EROS-2, Skills in Crop Production Systems Management

ACTIVITIES:

ACT-EROS-1, Erosion/Productivity Connection
KEY ACT-EROS-1, Erosion/Productivity Connection
ACT-EROS-2, Golf Ball Test
KEY ACT-EROS-2, Soil Erosion Productivity Study
ACT-EROS-3, Data Collection and Crop Management
KEY ACT-EROS-3, Data Collection and Crop Management
ACT-EROS-4, Summary
KEY ACT-EROS-4, Summary

ASSOCIATED CAREERS

Farmer
Farm Manager
Soil Conservationist
Agronomist
Crop Consultant
Soil Testing
Researcher

INTEREST APPROACH:

Use **VM-EROS-1** to cause the participants to do some reasoning on the affect of erosion on crop yields.

Answers to **VM-EROS-1** questions:

1. Ears and growth

2. Plants are rooted in different horizons of the soil, therefore, the soil quality is different.

3. Plants on eroded areas are evident in the community.

TEACHING PROCEDURE (allow 1 hour, 45 minutes):

1. In the last lesson we reviewed some unanswered questions such as "to what extent is soil loss reducing crop yields?" In this lesson we will become acquainted with a Soil Conservation Service study which is attempting to find some answers. Some agriculture departments in Iowa are assisting with this study. We

will see a video tape outlining the study "Erosion/Productivity Connection." Review questions on **ACT-EROS-1** as an introduction to the video.

2. Show the video "Erosion/Productivity Connection."

3. Ask participants to answer questions on **ACT-EROS-1** and provide answers using **KEY ACT-EROS-1**.

4. Hand out **ACT-EROS-2** for either a group exercise or ask each person to complete individually.

5. Handout answers on **KEY ACT-EROS-2**.

6. Also use **KEY-ACT-EROS-2** to explain the process of the SCS Erosion/Productivity study using sequential testing.

7. Place the following questions on a chalk board:

   What skills are needed in collecting data for the Erosion/Productivity Study? How do these skills relate to the systems approach in managing crops resulting in water quality and soil conservation?

   Use **ACT-EROS-3** in a group activity to illustrate the skills needed in data collecting that are also valuable in the systems approach in managing crops, soils, and water resources. Use **KEY-EROS-3** in discussing information needed in data collection and **VM-EROS-2** on crop production skills. These individual skills make up a crop production management system.

8. As **VM-EROS-2** is presented, **ask individuals to decide which data collecting skills listed in KEY ACT-EROS-3 would fall under the major skills needed in systems management as shown on VM-EROS-2.**

9. **What careers are associated with the content of this lesson?**

   Farmer, Agronomist, Farm Manager, Soil Conservationist, Crop Consultant, Soil Testing, Researcher.

10. Use **ACT-EROS-4** and **KEY-ACT-EROS-4** to summarize the lesson.

The next lesson will consider the results of the Erosion/Productivity study and the economics of soil conservation.

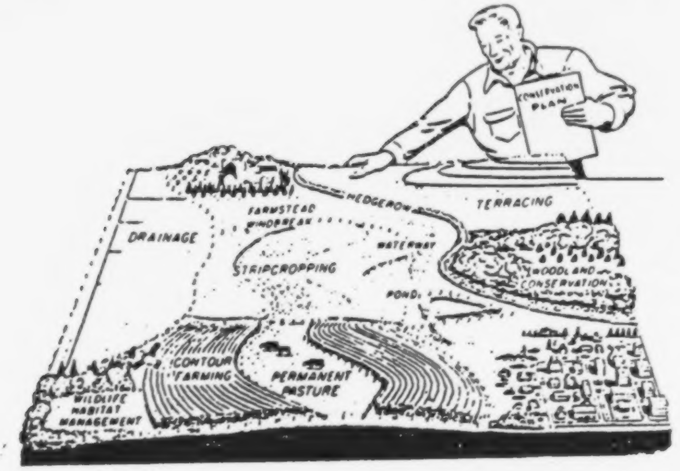
OTHER ACTIVITIES:

See the Natural Resources Activities Handbook, under topic, ag. skills, associated with the Erosion/Productivity Study and Systems Approach in managing crops for additional optional activities:

1. Locating study plot
2. Records management
   - Primary tillage
   - Seed bed preparation
   - Planting, cultivation, and growth information
   - Pesticide information
   - Fertility management
   - Crop damage information
   - Cropping and conservation history
   - Rainfall records
   - Estimating residue
3. Silking and stalk counts; and leaf sampling
4. Sampling, final stand count, corn harvest, ledging and corn borer damage

   Calculating yields

SKILLS IN CROP PRODUCTION SYSTEMS MANAGEMENT


CONSERVATION PLAN
HEDGEROW
TERRACING
FARMSTEAD WINDBREAK
DRAINAGE
WATERWAY
STRIPCROPPING
WOODLAND CONSERVATION
POND
CONTOUR FARMING
PERMANENT PASTURE
WILDLIFE HABITAT MANAGEMENT

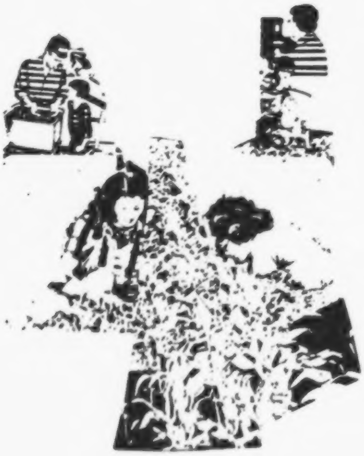
1. SKILL IN SOILS MANAGEMENT
   CAPABILITY OF SOILS,
   TILLAGE, NUTRIENTS
2. SKILL IN CROP MANAGEMENT
3. SKILL IN INSECT, DISEASE, AND WEED CONTROL
4. SKILL IN SOIL CONSERVATION AND WATER MANAGEMENT

EROSION/PRODUCTIVITY CONNECTION

A. What is threatening farmers' yields?

B. What visual signs were identified indicating a severely eroded soil?

C. What kinds of data are being collected in the study?



EROSION/PRODUCTIVITY CONNECTION

A. **What is threatening farmers' yields?**

Erosion (loss of top soil and associated soil environment).

B. **What visual signs were identified indicating a severely eroded soil?**

Poor stand, space between rows of crops is greater (or crops are smaller), tasseling is later, soil color different, more cloddy, more weedy, corn is anemic looking, less than three inches of top soil.

C. **What kinds of data are being collected in the study?**

Take stand counts, soil and crop management data from the farmer, soil samples, silking dates, leaf samples for nutrient content, fields inspected for disease and insect damage, final stand count, ear counts, weight of yield samples, moisture content of yield samples.

GOLF BALL TEST

You are given three golf balls to determine which ball will go the furthest distance in a hitting test. Use your own selected golf club. How would you set up a test procedure to determine this?

SOIL EROSION PRODUCTIVITY STUDY

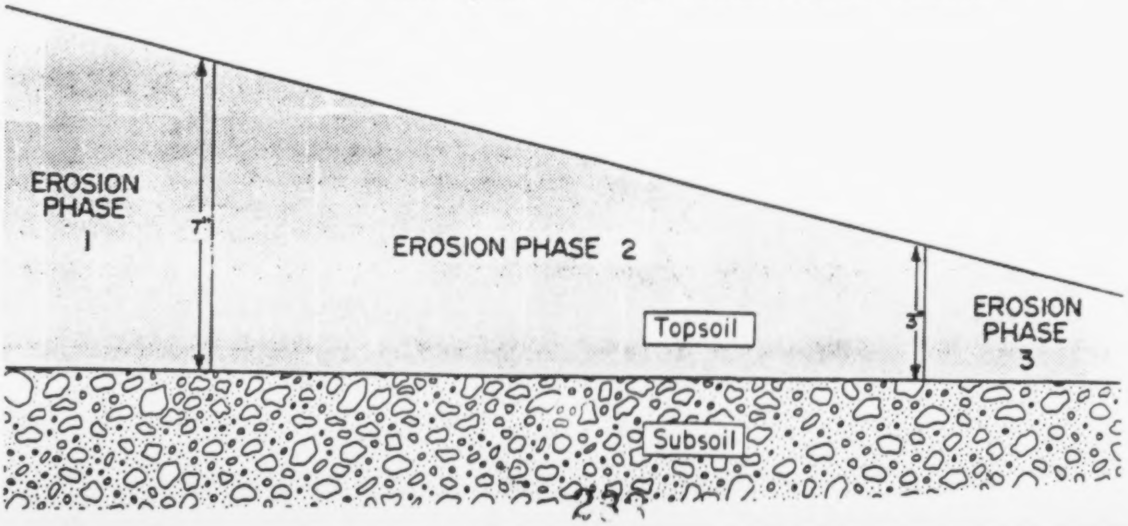
You would want to make sure you kept the swing of the golf club, its contact with the ball, and the golf club itself the same, as you hit the three balls. You would want to make sure you had a still day with no wind so the gusts of wind would not vary, as each ball was hit. You'd need to keep the following things constant, golf club, swing of the club, ball contact, and air or wind conditions.

This same process of keeping all crop growing conditions constant is essential in the Erosion/Productivity Study.

In your golf ball study, you may have selected a research method similar to much of the past field research. Much of the past field research has been done in a controlled, centrally located small plot work. The SCS Erosion Productivity Study is located on farms in 44 counties in Iowa. The study uses a sequential testing method designed to determine the difference in corn yields between (Phase 1: soils with over seven inches of top soil) (Phase 2: soils with three to seven inches of top soil) and Phase 3: the same soil with less than three inches of topsoil) as shown above.

Sequential testing is done for a sequence of soils within a field. Fields are chosen in which the eroded and uneroded soils of the same soil series occur. The weather and the farmer's management are the same within the field, which takes those two variables out of the factors which affect corn yields. Testing occurs over several crop years to determine the impact of erosion in seasons that are drier and wetter than normal. An analysis is made to evaluate the influence of soil properties, holding weather, and management constant.

The concept of this study is that loss of topsoil, reduced soil depth, and poor soil tilth that results from soil erosion are causes of loss of productivity. In most soils, loss of soil productivity is not recoverable. Losses due to erosion of the past will be suffered each year in the foreseeable future.



The Erosion/Productivity Study will:

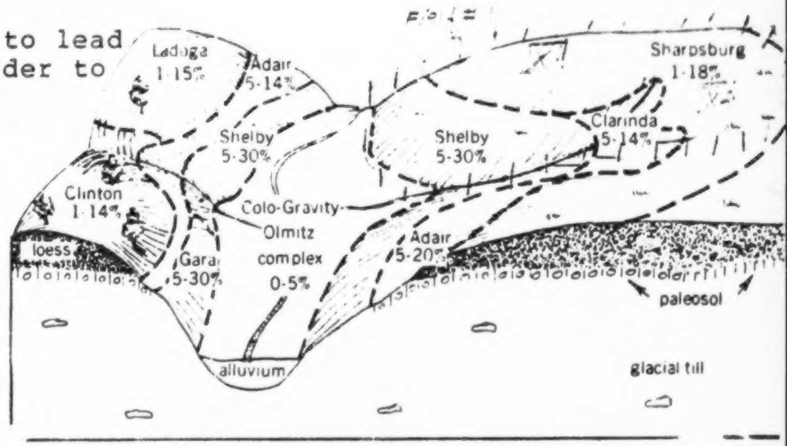
1. Help evaluate future options for controlling erosion.
2. Will help determine the costs to future generations of failure to apply soil conservation systems.
3. Will provide data for justifying soil conservation programs to sustain soil productivity.

If you plan to do research on farms, the first step you should follow is to get permission of the farmer to use the field.

DATA COLLECTION AND CROP MANAGEMENT SKILLS

GROUP TASKS:

1. Select a group leader to lead discussion and a recorder to take notes.
2. Situation:


Ladoga 1-15%
Adair 5-14%
Sharpsburg 1-18%
Shelby 5-30%
Shelby 5-30%
Clarinda 5-14%
Clinton 1-14%
Colo-Gravity-Olmitz complex 0-5%
Adair 5-20%
loess
Gara 5-30%
paleosol
alluvium
glacial till

You are to establish study plots at sites X1 and X2 in Field 1 on Sharpsburg soil. X1 is eroded, (Phase 2, three to seven inches of soil remaining) X2 is Phase 1 (over seven inches of topsoil remaining). The owner of this farm, farms Field 1 on the contour, using the same hybrid variety of corn and using the same rate of fertilizer through the field.

YOUR TASK:

1. List the kinds of information you will need to collect on the two sites to determine that any differences in corn yields on the two sites is due to erosion.
2. Explain how the information collected for the study and the skills needed to collect the information would be beneficial in crop management, resulting in the maintenance of water quality and soil productivity.

DATA COLLECTION AND CROP MANAGEMENT SKILLS

First you must get the farmer's permission to use the field for the study.

1. Following is a list of information needed on Sites X1 and X2:

    a. Mark the plot areas in the field (minimum 50' x 50') and on an aerial photo

    b. Count and record corn plants in each row (calculate plants per acre)

    c. Estimate residue on the surface (refer to demonstration in the Natural Resources Activities Handbook)

    d. Record the percent slope of the plots and percent of slope of rows if not on the contour and slope aspect (facing east, west, north, or south)

    e. Record the description of the soil profile and get soil samples to determine fertility level within the soil profile.

    f. Get soil moisture sample at planting time

    g. Place a rainfall gauge near the plots and record rainfall

    h. Have the owner give you information on how the field has been managed in the past - kind of tillage; conservation and cropping history; this year's planting date; corn variety; corn maturity; planting rate; approximate number of days before the corn emerged; suspected cause of slow emergence; cultivations; date applied, method, rate, and kind of pesticide used; date, method, rate, and kind of fertilizer used or manure usage; damage from hail, disease, or frost; drainage from tile if within 200 feet of a tile line.

    i. Height of corn

    j. Water, insect, or tillage damage (record percentage of stalks showing leaf feeding of insects)

    k. Determine when 75 percent of silking has occurred

    l. At silking, check number of stalks in rows per acre

m. Take leaf sample to determine nutrient level in plant

n. Record extent of root and stalk lodging

o. Pull weeds to free from weed competition

p. Record extent of moisture stress and nutrient deficiency

q. Take root samples (evaluate root damage)

r. Hand harvest, pick and count ears, count barren stalks

s. Count and record sampling of corn borer cavities

t. Weight and shell corn for moisture sample

u. Calculate yield (converting plot yield to per acre yield)

2. **How are the above data collecting skills valuable in using a systems approach in crop production; and soil and water quality management?**

It is important to not only know how to collect research data, but to understand how these skills and the information relates to maintaining desirable yields at minimum costs and in a way to maintain soil and water quality. These skills will be covered in the next activity.

SUMMARY

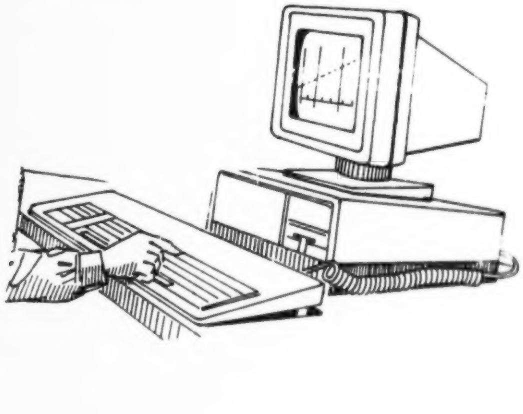
1. How does erosion threaten the farmer's yield?

2. What skills learned in the erosion/productivity study will be useful in crop production systems management?

3. How are soil management, crop management, soil conservation, and water management related?

4. In researching the answer to "How much does erosion reduce crop yields?" what must be kept constant to know that the factor making yield difference is erosion?

5. What records are needed for a farm manager to use the systems approach to crop management?



SUMMARY

1. **How does erosion threaten the farmer's yield?**

   Loss of topsoil reduced soil depth and poor tilth that results from soil erosion are causes of loss of soil productivity.

2. **What skills learned in the erosion/productivity study will be useful in crop production systems management?**

   Skills in soils management, crop management, insect and disease control, soil conservation, water management.

3. **How are soil management, crop management, soil conservation, and water management related?**

   a. By knowing the capability of the soil (fertility level, erosiveness, and texture) the correct tillage methods and conservation systems can be used to maintain soil tilth, soil structure, top soil, and water quality.

   b. The vigor and health of the plant (crop) is important to the yield and profits; and early plant cover to protect the soil from erosion. Plants must be monitored to apply timely insect and disease control methods. Chemical usage must be limited to only actual need to reduce water pollution.

4. **In researching the answer to "How much does erosion reduce crop yields?" what must be kept constant to know that the factor making yield difference is erosion?**

   Weather and management are kept constant. The soil is varied (erosion phases of the same soil series). The texture of the soil needs to remain constant.

5. **What records are needed for a farm manager to use the systems approach to crop management?**

   Plant population; estimate % cover of residue; slope of land; soil types; soil moisture; rainfall; kind of tillage; planting variety and date; planting rate; crop emergence; kind and dates of pesticides; kind and rate of fertilizer; hail, insect, disease, water, tillage, or frost damage; tile drainage; silking dates; plant nutrient deficiency; root and stalk lodging; and yield.

LESSON FIVE

ECONOMIC LOSSES DUE TO EROSION

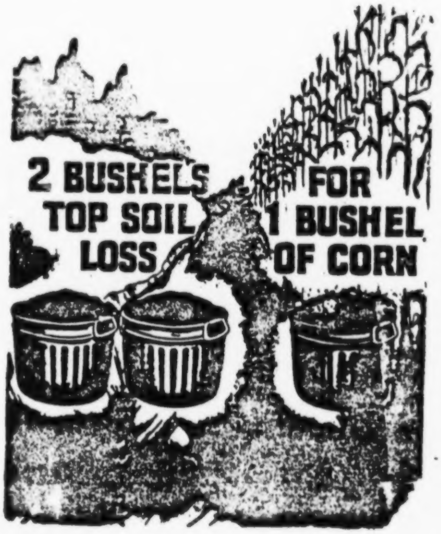
LESSON 5

LESSON: Understanding the Economic Losses Due to Erosion.

OBJECTIVES:

After completion of this lesson, the participants will be able to:

1. Recognize the economic connection associated with soil erosion.
2. Understand the cost of erosion.
3. Recognize the cost of conservation systems.
4. Identify the benefits from practicing conservation.



MATERIALS AND REFERENCES:

Six (6) $1 Bills

Overhead Projector

VISUAL MASTERS:

VM-ECON-1, Costs of Yield Losses
VM-ECON-2, Graph
VM-ECON-3, Conservation Benefits

ACTIVITIES:

ACT-ECON-1, Computing Losses Due to Erosion
KEY ACT-ECON-1, Computing Losses Due to Erosion
ACT-ECON-2, Pages from Losing Ground
ACT-ECON-3, Economics Summary
KEY ACT-ECON-3, Economics Summary

Developed by Eldon Weber, May 1988

ASSOCIATED CAREERS:

Farmer
Economist
Farm Manager
Loan Officer

INTEREST APPROACH: (allow 15 minutes)

Demonstration:

If you lose $1 an acre due to soil erosion, with each new year's erosion, how much would the accumulated loss be for three years?

How much for the first year?

1st year - $1 (hold up $1 bill)

How much for the second year?

2nd year - $2 ($1 + $1) (hold up $2 bills, plus $1 for the first year)

How much for the third year?

3rd year - $3 ($1 + $1 + $1) (hold up $3 bills, plus the $2 bills for the second year, and the $1 for the first year)

Making a total of $6.

This is the way economic losses occur if soil erosion is left unchecked. We'll learn more about the process.

TEACHING PROCEDURE:

1. As a review, let's recall what the three erosion phases mean:

   Ask students and place answers on the chalk board.

   Erosion Phase 1 has over 7 inches of top soil remaining.

Erosion Phase 2 is moderately eroded soil meaning 3 to 7 inches of top soil remaining and some of it is mixed with subsoil.

Erosion Phase 3 is severely eroded soils with less than 3 inches of topsoil and it is well mixed with the subsoil.

2. Data gathered so far in the erosion-productivity study shows the following: On loess-derived soils (wind blown), a 10-bushel corn yield reduction can be common when you compare slightly eroded to moderately eroded soil. On severely eroded glacial till soils (derived from soils that have formed following glacier activity) the yield reduction has been about 20 bushels per acre.

3. Use **ACT-ECON-1** to get individuals involved in estimating the dollar loss on a farm due to erosion. Use **KEY-ACT-ECON-1** for answers.

4. Use **VM-ECON-1** to show the 30-year yield and cost losses.

5. Use **VM-ECON-2** to discuss the early trends of the soil erosion productivity study. Ask, from this graph, **what are the yield differences on glacial till soils from 0 to 3 inches of top soil?**

   Answer: 100 - 78 bushels per acre = 22 bushel difference.

   What are the yield differences from lowest to highest yields on glacial till soils (from 0 to 20 inches of topsoil)?

   Answer: 125 - 78 bushels per acre = 47 bushels.

   What are the yield differences from lowest to highest yields on loess soils (from 0 to 20 inches of topsoil)?

   Answer: 145 - 130 bushels per acre = 15 bushels.

6. Use **ACT-ECON-2** (2 pages) to reinforce the concept that costs add up over time.

7. Ask the following question to generate a discussion, **"With the $530 per acre loss over 30 years, arrived at in our first activity, how much do you think the farmer can spend on conservation systems purely from an ecomonic point of view?"** By using most available

conservation systems, which are low cost or virtually no cost, conservation is a very good investment.

8. Generate a discussion in estimating costs of conservation systems such as crop rotation, contouring, conservation tillage, and contour strip cropping. Ask the question, **"Does conservation pay?"**

9. After covering the following facts use **VM-ECON-3** to summarize the principal reasons for practicing conservation. Five and four tenths (5.4) billion tons of soil erodes on non-federal rural land in the United States each year. The U.S.D.A. estimates that annual costs of erosion damage are $866 million on the farm and $2.17 billion off the farm each year.

10. **What careers would be associated with the content of this lesson?**

    Answer: Farmer, Economist, Farm Manager, and Loan Officer.

11. Summarize the lesson by using **ACT-ECON-3** and **KEY ACT-ECON-3.**

12. The next lesson will deal with the cost of soil leaving the farm as it settles in unwanted places.

OTHER ACTIVITIES:

Individuals could locate the description of soils in their county or on their farm using the soil survey to estimate potential yield loss. Soils being identified for comparison should evaluate till vs. loess, erosion phases, texture, and organic matter. Discuss reasons why, based on the above factors, you might expect a yield difference from erosion phases 1, 2, and 3.

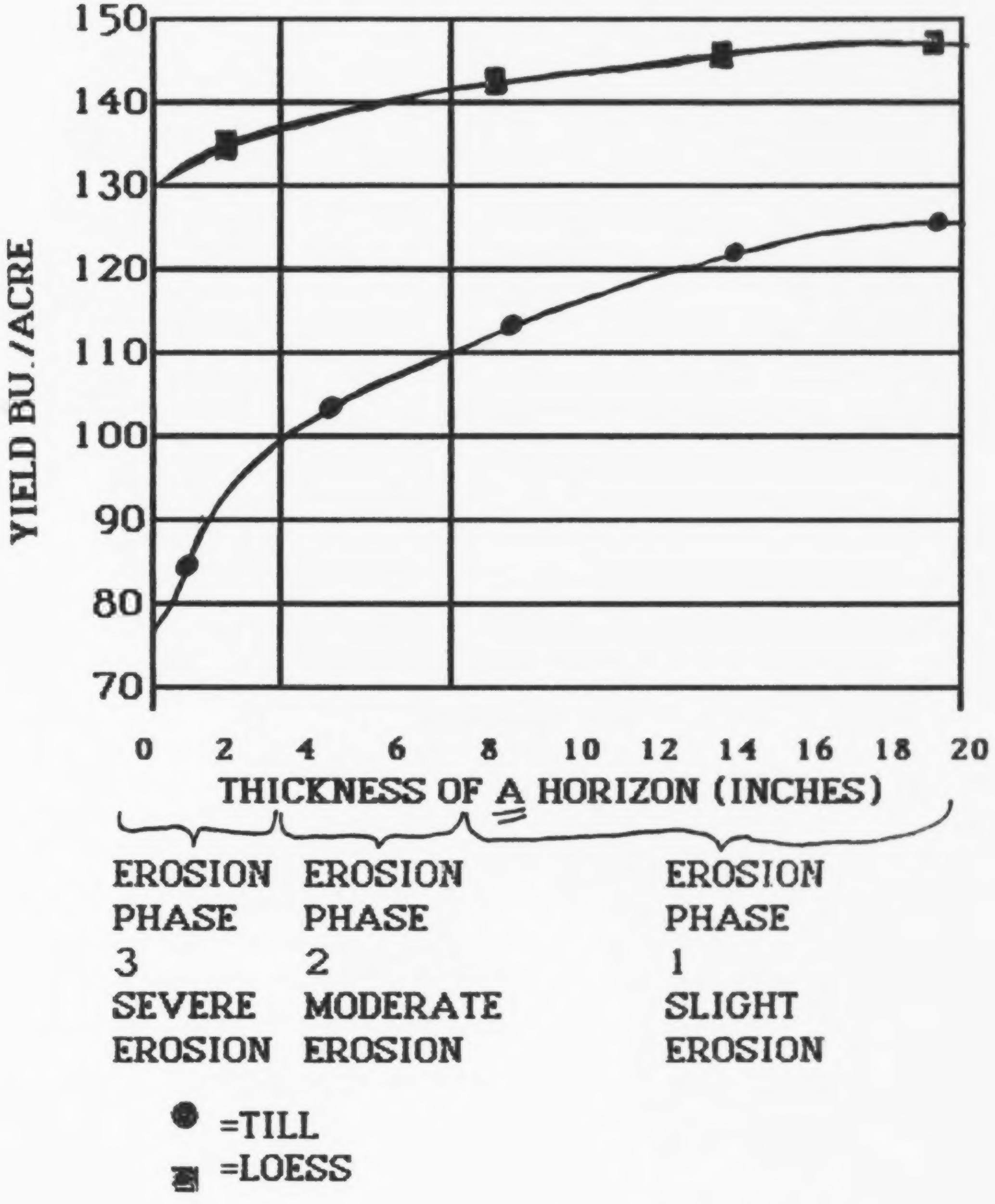
Analyze the soils based on the change of properties such as textures, root depth, and nutrient level that results when the soil is eroded from phase 1 to phase 3.

COST OF YIELD LOSSES DUE TO SOIL EROSION ON A 200-ACRE FARM

YEAR	BUSHELS LOST	COST PER YEAR	ACCUMULATED COST
1	133	$ 239	$ 239
2	267	481	720
3	400	720	1,440
4	533	960	2,400
9	1,200	2,160	10,800
15	2,000	3,600	28,800
20	2,667	4,804	50,400
30	4,000	7,200	106,000

SOME FIGURES ARE ROUNDED OFF

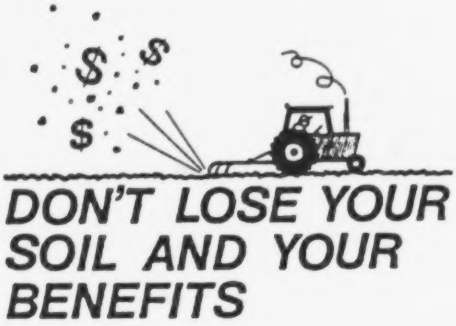
PLOT OF THICKNESS OF A HORIZON VS YIELD



VM-ECON-3

CONSERVATION BENEFITS

REASONS FOR PRACTICING SOIL AND WATER CONSERVATION


$
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DON'T LOSE YOUR SOIL AND YOUR BENEFITS

1. IT'S COST EFFECTIVE FOR THE FARMER TO MAINTAIN YIELDS.

2. STEWARDSHIP OF SOIL AND WATER PROVIDES FOR A HEALTHY ENVIRONMENT AND SUSTAINED FOOD AND FIBER PRODUTION.

3. U.S.D.A. 1985 FOOD SECURITY ACT BENEFITS FOR THOSE WITH HIGHLY ERODIBLE LAND.

4. EROSION OF SOIL ACCUMULATES OFF THE FARM (OFF-SITE), WHICH IS A COST TO TAXPAYERS. (PREVENTING EROSION WILL PROVIDE FOR TAX RELIEF.)

ACT-ECON-1

Computing Losses Due to Erosion

EXERCISE:

You have a farm with 200 acres of corn which is averaging 20 tons per acre per year soil loss. (Twenty tons per acre per year loss is equal to 2/15 of an inch.) (The thickness of two dimes). If you don't stop erosion on your farm, in 30 years you'll lose four inches of top soil which wil move your soil from slightly eroded (phase 1) to moderately eroded (phase 2). Based on data collected so far, assume you will have a 20 bushels per acre yield reduction over the next 30 years due to erosion.

1. 20 bushels per acre x 200 acres = 4000 bushels less corn on the farm in the 30th year.
2. 4000 less bushels divided by 30 years = 133 bushel reduction each year

QUESTION 1: **How many fewer bushels of corn would be produced the second year if erosion was left uncontrolled?**

Answer:

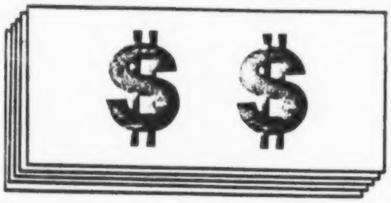
QUESTION 2: **Your accumulated production loss due to erosion at the end of the second year is how much?**

Answer:

KEY ACT-ECON-1

Computing Losses Due to Erosion

EXERCISE:



You have a farm with 200 acres of corn which is averaging 20 tons per acre per year soil loss. (Twenty tons per acre per year loss is equal to 2/15 of an inch.) If you don't stop erosion on your farm, in 30 years you'll lose four inches of top soil which will move your soil from slightly eroded (phase 1) to moderately eroded (phase 2). Based on data collected so far, assume you will have a 20 bushels per acre yield reduction over the next 30 years due to erosion.

1. 20 bushels per acre x 200 acres = 4000 bushels less corn on the farm in the 30th year.
2. 4000 less bushels divided by 30 years = 133 bushels reduction each year

QUESTION 1: **How many fewer bushels of corn would be produced the second year if erosion was left uncontrolled?**

Answer: 133 bushels less the first year + 133 bushels the second year for a total of 266 bushels. (Each individual year's soil loss is added to all previous year's losses.)

At only $1.80 per bushel, the 133 bushels you lose next year are worth $239. The 266 bushels you don't produce in the second year would have been worth $481.

QUESTION 2: **Your accumulated production loss due to erosion at the end of the second year is how much?**

Answer: $239 the first year + $481 the second year = $720

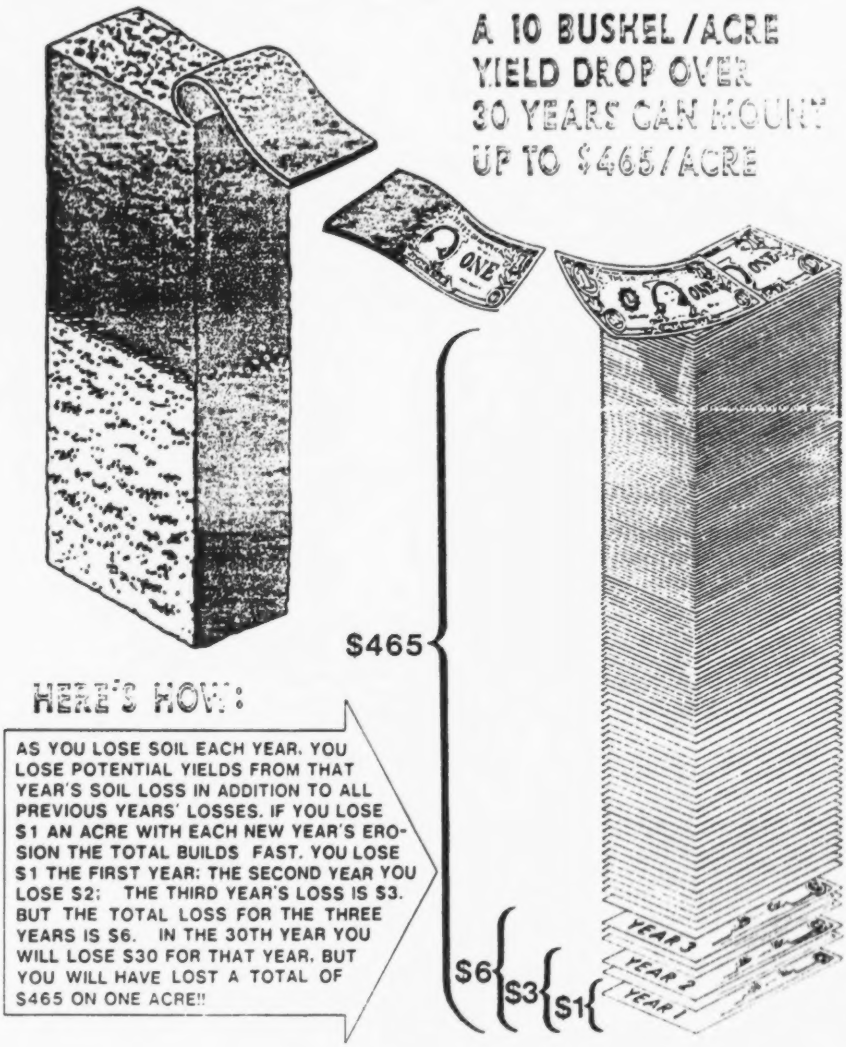
By the end of the 30th year, your production will be down 4000 bushels or $7,200 farm loss in the 30th year. ($106,000 accumulated total loss over the 30-year period or $530 loss per acre, $106,000 divided by 200 = $530)

That's a bunch of money. Erosion losses aren't cheap. Any soil you lose at a rate that exceeds the rate at which natural processes can create new soil is gone forever.

Costs Add Up Over Time

SOIL LOSSES ADD UP IN DOLLAR$

A 10 BUSHEL/ACRE YIELD DROP OVER 30 YEARS CAN MOUNT UP TO $465/ACRE



HERE'S HOW:

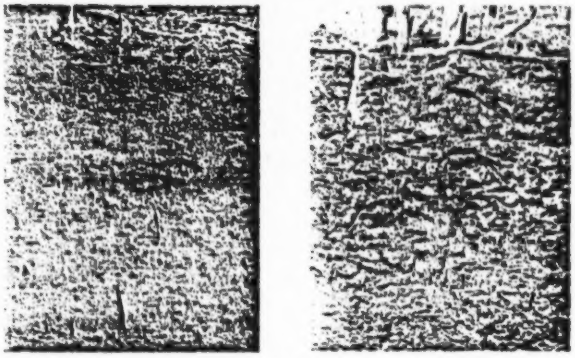
AS YOU LOSE SOIL EACH YEAR, YOU LOSE POTENTIAL YIELDS FROM THAT YEAR'S SOIL LOSS IN ADDITION TO ALL PREVIOUS YEARS' LOSSES. IF YOU LOSE $1 AN ACRE WITH EACH NEW YEAR'S EROSION THE TOTAL BUILDS FAST. YOU LOSE $1 THE FIRST YEAR; THE SECOND YEAR YOU LOSE $2; THE THIRD YEAR'S LOSS IS $3. BUT THE TOTAL LOSS FOR THE THREE YEARS IS $6. IN THE 30TH YEAR YOU WILL LOSE $30 FOR THAT YEAR, BUT YOU WILL HAVE LOST A TOTAL OF $465 ON ONE ACRE!!

Erosion Cuts Crop Yields

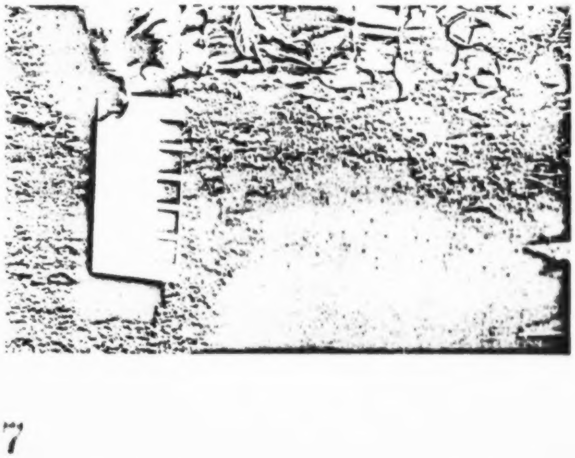
The effects of topsoil loss have largely been masked in Iowa by the use of commercial fertilizer and improved crop varieties. But there are signs crop yields are reaching a peak, and topsoil will be increasingly important.

Preliminary results from an erosion-productivity study show that corn yields may drop by 20 bushels an acre on Iowa's severely eroded glacial till soils.

Yield differences are most dramatic when the crop is under stress, such as in a dry year. Poor stands, slow growth, later corn tasseling, and lower yields are all signs of eroded soils.



Light colored soils often indicate that most or all the topsoil is eroded from an area (top). Moderately eroded soils have 3 to 7 inches of topsoil remaining (above left); severely eroded soils have less than 3 inches of topsoil (above right).



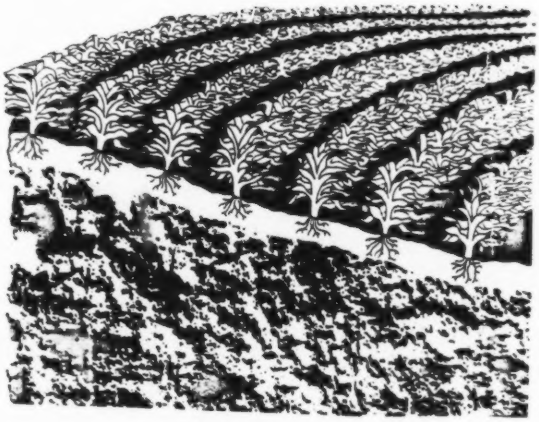
Severely eroded soil is light colored and low in organic matter; the spadeful of noneroded topsoil is rich in organic matter.

Economics Survey

1. Name two low cost conservation systems that should be considered on highly erodible land?

2. Name two reasons for practicing soil and water conservation on highly erodible land.

3. Give examples of low cost conservation systems.



Economics Survey

1. **Name two low cost conservation systems that should be considered on highly erodible land?**

   Answer: Should include:

   Crop rotation
   Contouring
   Conservation tillage
   Contour strip cropping
   Seeded to grass or planted to trees (conservation reserve)

2. **Name two reasons for practicing soil and water conservation on highly erodible land.**

   Answer: It is cost effective for the farmer to maintain yields.

   Stewardship of soil and water provides for a healthy environment and sustained food and fiber production.

   For the benefits provided by the U.S.D.A. 1985 Food Security Act.

   Erosion of soil accumulates off the farm (off-site), which is a cost to taxpayers.

3. **Give examples of low cost conservation systems.**

   Answer: Crop rotation, contouring, conservation tillage and contour strip cropping. (grass headlands and grass waterways may be needed on sloping land)

SUMMARY:

For the nation, excessive erosion permanently damages our resources, restricts our ability to feed future generations, and hurts the long term economic health of our communities.

LESSON SIX

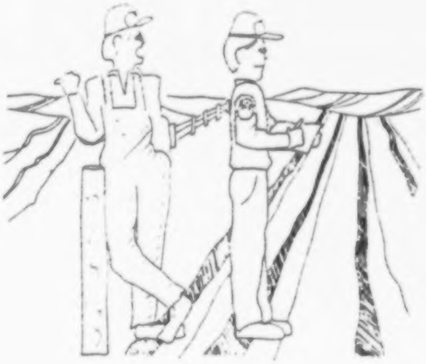
OFF - SITE COSTS OF EROSION

LESSON 6

LESSON: Recognizing Costs and Damages of "Off-site" Erosion (Erosion Consequences on the Neighbor)

OBJECTIVES:

Upon completion of this lesson, participants will be able to:



1. Recognize the off-site costs of erosion (eroded soil that is dumped downstream).
2. Recognize the kinds of damages caused by soil that leaves the farm.
3. Recognize the benefits if erosion is controlled.
4. Associate careers with the topic areas covered.

MATERIALS AND REFERENCES:

"Choked Streams, Clogged Waterways, a Dirty Shame," video by U.S. Soil Conservation Service. (Program 4 on Soil Conservation video tape)

Video Player

Overhead Projector

VISUAL MATERIALS:

VM-OFF-SITE 1, Erosion

Developed by Eldon Weber, May 1988

ACTIVITIES:

ACT-OFF-SITE-1, Choked Streams, Clogged Waterways, a Dirty Shame

KEY ACT-OFF-SITE-1, Choked Streams, Clogged Waterways, a Dirty Shame

ACT-OFF-SITE-2, Who's Responsibility
KEY ACT-OFF-SITE-2, Who's Responsibility
ACT-OFF-SITE-3, Off-site Costs of Erosion
KEY ACT-OFF-SITE-3, Off-site Costs of Erosion

ASSOCIATED CAREERS:

Soil Conservationist
Fish and Wildlife Biologist
Agriculture Engineer
Civil Engineer
Water Treatment Plant Manager
Farmer

INTEREST APPROACH:

Have you heard, "That's my neighbor's problem"?

Sociology studies show the majority of people feel that the erosion problem worsen the further they get from home.

Use **VM-OFF-SITE-1** to generate interest in who is responsible for the erosion problem. Ask for participant's views.

TEACHING PROCEDURES (allow 35 minutes):

1. Hand out **ACT-OFF-SITE-1** and ask that individuals look for the answers as they watch a video entitled "Choked Streams, Clogged Waterways, a Dirty Shame." Show the video. Use **KEY ACT-OFF-SITE-1** for answers.

2. Use **ACT-OFF-SITE-2** to generate group discussions on the subject of **"Who should take the responsibility to prevent off-site erosion damages and who should pay the costs of cleaning up sediment damages?"** Use **KEY ACT-OFF-SITE-2** for responses. Try to get the group's consensus on how the responsibility and costs should be divided.

3. Place the following question on the chalk board:

   What careers might be associated with this lesson and how does the topic material that we've covered apply to each?

   Answer:

   Soil Conservationist: provides technical assistance relating to erosion control.

   Fish and Wildlife Biologist: manages water bodies and wildlife habitat.

   Agriculture and Civil Engineers: design and plan erosion and sediment control measures.

   Water Treatment Plant Manager: manages water quality

   Farmer: uses conservation systems to control erosion

4. Use **ACT-OFF-SITE-3** and **KEY ACT-OFF-SITE-3** to review lesson content.

In conclusion, we have:

1. Studied the costs of off-site erosion in the areas of transportation, recreation, wildlife, and municipal water supplies. The cost of erosion is sizeable when we add together on-farm and off-site erosion costs.

2. Concluded that an erosion control program benefits everyone.

3. Looked at some careers that are associated with the causes and control of off-site erosion.

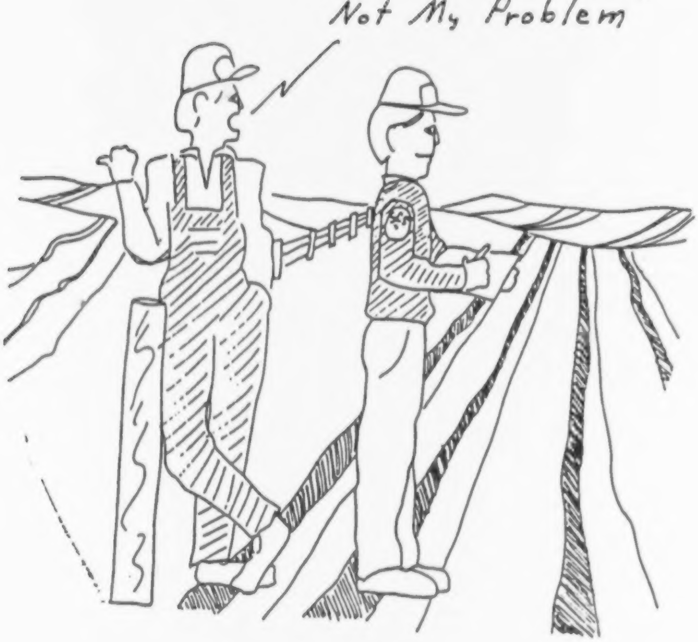
As we conclude this unit, we might reflect on the following:

Booker T. Washington was quoted as saying "No race can prosper 'till it learns that there is as much dignity in tilling a field as in writing a poem".

OTHER ACTIVITIES:

Ask individuals to survey the community and interview public officials to estimate annual off-site erosion damage in the community or county. Refer to "Losing Ground" (reference with this notebook) as a guide to the damages that might be addressed.

EROSION


"Not My Problem"

WHO'S PROBLEM IS IT?

ACT-OFF-SITE-1

CHOKED STREAMS, CLOGGED WATERWAYS
A DIRTY SHAME

1. **Which appears to be a bigger cost: loss of productivity or damage caused by sediment?**

2. **Name the damages caused by sediment.**

3. **Who pays the cost of off-site erosion damage?**

4. **Who benefits if erosion is controlled?**

NEWS

Save Our Soil

KEY ACT-OFF-SITE-1

CHOKED STREAMS, CLOGGED WATERWAYS
A DIRTY SHAME

1. **Which appears to be a bigger cost: loss of productivity or damage caused by sediment?**

   Damage caused by sediment.

2. **Name the damages caused by sediment.**

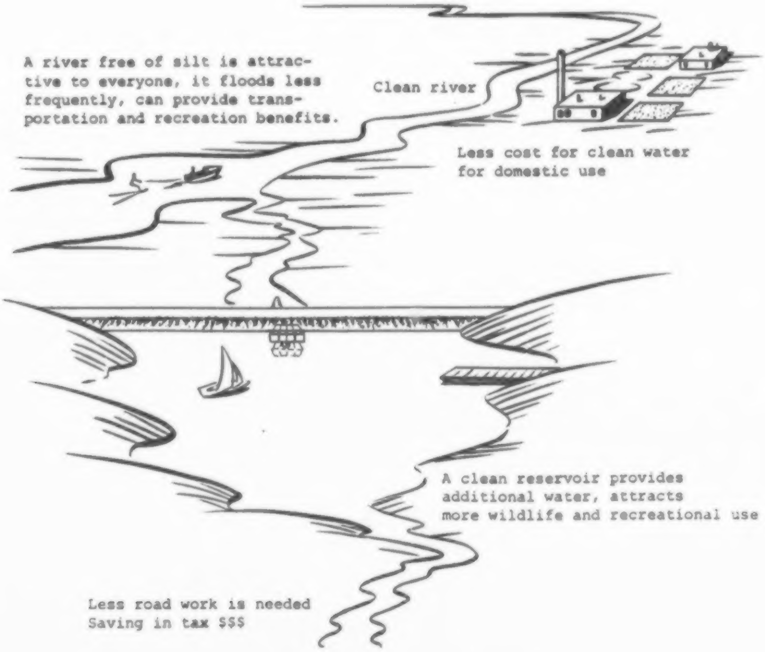
   Conservation practices such as dams, block drainage ways and culverts (the blockage contributes to flooding), road ditches, legal drainage ditches, roadbeds, public recreation areas, fish and wildlife, (water areas), and municipal water supplies.

3. **Who pays the cost of off-site erosion damage?**

   Virtually everyone (society through increased taxes).

4. **Who benefits if erosion is controlled?**

   Everyone - both the individual farmer and society in general.

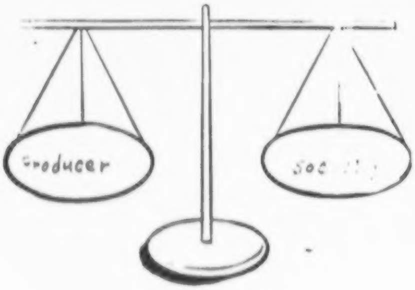

A river free of silt is attractive to everyone, it floods less frequently, can provide transportation and recreation benefits.
Clean river
Less cost for clean water for domestic use
A clean reservoir provides additional water, attracts more wildlife and recreational use
Less road work is needed Saving in tax $$$

ACT-OFF-SITE-2

WHO'S RESPONSIBILITY?

Divide into groups for debating the following issues:

WEIGH THE ISSUES



Group 1: Be prepared to discuss:

A. Why the farmer should be responsible in controlling soil erosion from leaving the farm.

B. Why the taxpayers should not have to pay the costs of repairing damages caused by sediment.

Group 2: Be prepared to discuss:

A. Why the farmer should not be responsible in controlling soil erosion from leaving the farm.

B. Why the taxpayers should pay the costs of repairing damages caused by sediment.

Group 3: Judge the debate and declare the winning team based on their use of factual information and final conclusions on a cooperative approach, where farmers and society in general could benefit.

All Groups: At the conclusion of the debate, cooperatively decide who benefits, how costs might be divided and what are possible sources of funds.

WHO'S RESPONSIBILITY?

ANSWER:

There is no one answer, as each should share some of the burden. Some would say the individual should control erosion within the tolerable level (level at which top soil develops) and society should deal with the balance. Principles learned from the last lesson should be addressed such as the importance of stewardship, conservation pays and society benefits from a strong economy enhancing the environment for the health and welfare of present and future generations. A discussion on the justification of state and federal cost sharing and the Food Security Act benefits should enter into the discussion.

Point out the need for a good educational program, to avoid pitting farmers against society in general, so everyone recognizes it is essential to have a cooperative effort.

Have the groups come to a consensus on the percent cost sharing needed by the farmer to help pay for conservation systems.

Questions to discuss might be:

Should soil conservation programs remain voluntary?

Who should pay for soil conservation work?

How much involvement should federal and state government have in soil conservation programs?

"OFF-SITE" COSTS OF EROSION

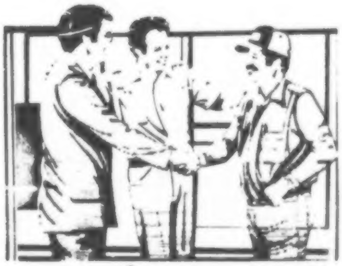
1. How does sediment contribute to flooding?

2. What is the best way to reduce sediment damages?

3. What is the estimated annual cost to the public to correct off-site erosion damages in Iowa?

4. How does sediment adversely affect fish?

5. What careers are associated with this lesson?



"OFF-SITE" COSTS OF EROSION

1. **How does sediment contribute to flooding?**

   It plugs waterways, drainage ways, dams, and culverts which diverts water to crop land and other high value areas.

2. **What is the best way to reduce sediment damages?**

   To keep soil in place through the use of conservation systems.

3. **What is the estimated annual cost to the public to correct off-site erosion damages in Iowa?**

   Over $32 million. The estimated annual damages due to "off-site" erosion is over twice the estimated $32 million dollars being spent.

4. **How does sediment adversely affect fish?**

   Sediment fills in water bodies increasing water vegetation, which increases cover for small pan fish. This results in a large population of fish, which become stunted and slow growing.

5. **What careers are associated with this lesson?**

   Soil Conservationist, Fish and Wildlife Biologist, Agriculture and Civil Engineer, and Water Treatment Plant Manager